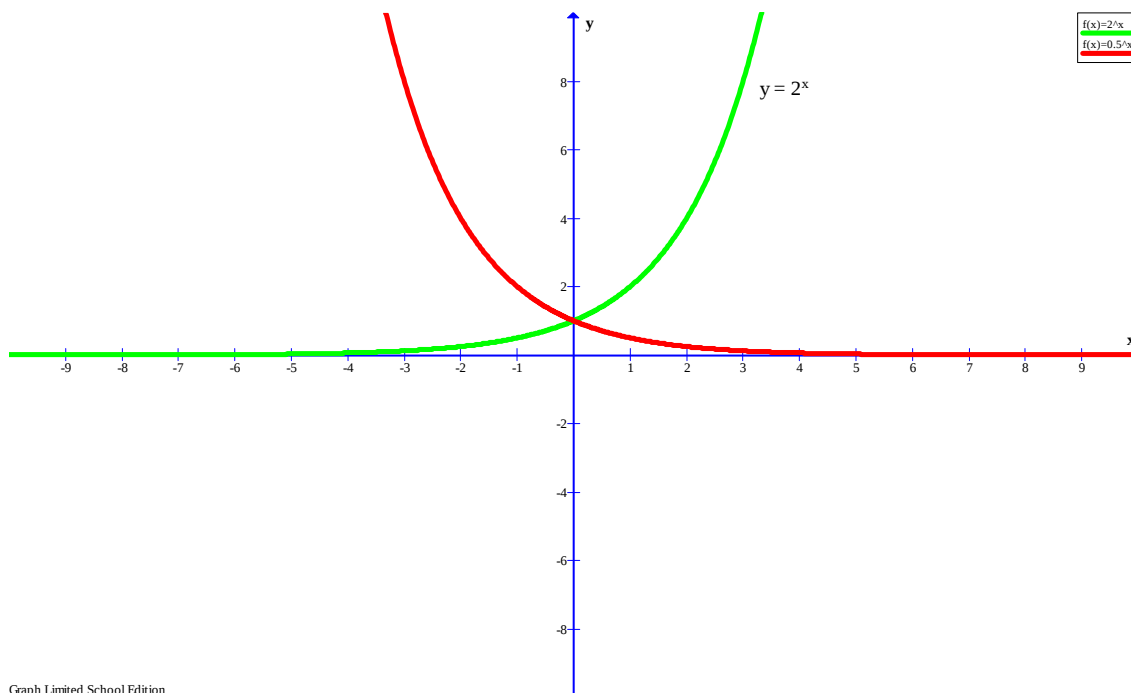


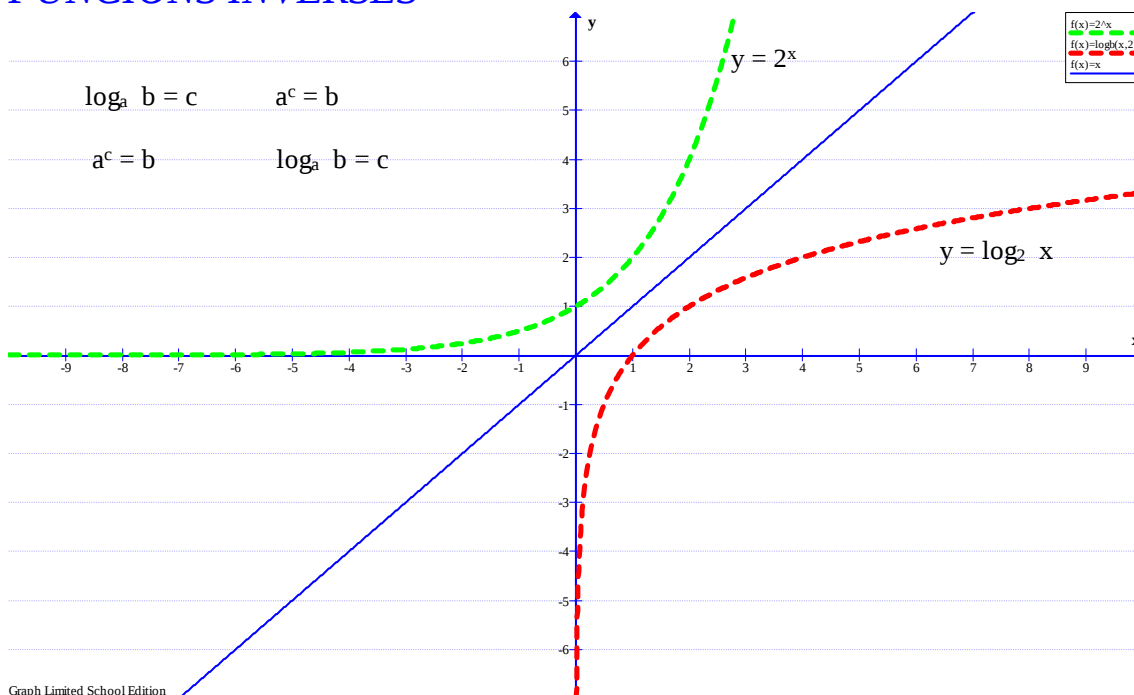
**Funció exponencial****FUNCIO EXPONENCIAL****1.CALCUL****2.EQUACIONS****3.SISTEMES****4.GRÀFIQUES****5.INEQUACIONS**

Graph Limited School Edition

| <b>Funció Exponencial</b><br>$y = a^x \quad a > 0$                                                                           |           |   |          |  |                                                                                                                                                                                                                                             |           |   |          |
|------------------------------------------------------------------------------------------------------------------------------|-----------|---|----------|--|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|---|----------|
| $y = a^x \quad a > 1$<br><br><i>Exemple</i> $y = \begin{cases} 2^x \\ \left(\frac{5}{2}\right)^x \\ e^x \\ 10^x \end{cases}$ |           |   |          |  | $y = a^x \quad 0 < a < 1$<br><br><i>Exemple</i> $y = \begin{cases} 2^{-x} = \left(\frac{1}{2}\right)^x \\ \left(\frac{5}{2}\right)^{-x} = \left(\frac{2}{5}\right)^x \\ e^{-x} = \left(\frac{1}{e}\right)^x \\ 10^{-x} = 0.1^x \end{cases}$ |           |   |          |
| <b>Taula de valors</b>                                                                                                       |           |   |          |  | <b>Taula de valors</b>                                                                                                                                                                                                                      |           |   |          |
| x                                                                                                                            | $-\infty$ | 0 | $\infty$ |  | x                                                                                                                                                                                                                                           | $-\infty$ | 0 | $\infty$ |

**Funció exponencial**

|                                                                                                                                                                                                                                    |                                                                                                                                                                                                                                    |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $y$ <b>+0</b> <b>1</b> <b><math>\infty</math></b><br><i>Domini</i> $(-\infty, \infty)$<br><i>Imatge</i> $(0, \infty)$                                                                                                              | $y$ <b><math>\infty</math></b> <b>1</b> <b>+0</b><br><i>Domini</i> $(-\infty, \infty)$<br><i>Imatge</i> $(0, \infty)$                                                                                                              |
| <i>Propietats</i>                                                                                                                                                                                                                  | <i>Propietats</i>                                                                                                                                                                                                                  |
| <i>Impossibilitat de prendre valor negatiu o zero</i><br><i>Valor de la imatge positiva</i><br>$a^x > 0$                                                                                                                           | <i>Impossibilitat de prendre valor negatiu o zero</i><br><i>Valor de la imatge positiva</i><br>$a^x > 0$                                                                                                                           |
| <i>Resolució d'equacions</i><br><i>No hi ha dues altures iguals</i><br>$a^x = a^y \Leftrightarrow x = y$                                                                                                                           | <i>Resolució d'equacions</i><br><i>No hi ha dues altures iguals</i><br>$a^x = a^y \Leftrightarrow x = y$                                                                                                                           |
| <i>Resolució d'inequacions</i><br><i>Funció estrictament creixent</i><br><b><math>a^x &gt; a^y \Leftrightarrow x &gt; y</math></b>                                                                                                 | <i>Resolució d'inequacions</i><br><i>Funció estrictament decreixent</i><br><b><math>a^x &gt; a^y \Leftrightarrow x &lt; y</math></b>                                                                                               |
| <i>Operacions amb potències</i><br>$a^{x+y} = a^x a^y \Leftrightarrow a^x a^y = a^{x+y}$<br>$a^{x-y} = \frac{a^x}{a^y} \Leftrightarrow \frac{a^x}{a^y} = a^{x-y}$<br>$[a^x]^y = a^{xy} \Leftrightarrow a^{xy} = [a^x]^y = [a^y]^x$ | <i>Operacions amb potències</i><br>$a^{x+y} = a^x a^y \Leftrightarrow a^x a^y = a^{x+y}$<br>$a^{x-y} = \frac{a^x}{a^y} \Leftrightarrow \frac{a^x}{a^y} = a^{x-y}$<br>$[a^x]^y = a^{xy} \Leftrightarrow a^{xy} = [a^x]^y = [a^y]^x$ |

**FUNCIONS INVERSES**



## Funció exponencial

### PROPIETATS D'AMBDUES FUNCIONS

Transformació d'un logaritme en potència i a l'inrevés

Funcions simètriques respecte de la recta  $y=x$

$$\log_a b = c \Leftrightarrow b = a^c$$

Transformació d'un nombre  $x$  en potència o en logaritme segons convingui

Composició de funcions  $x = \log_a a^x$   $x = a^{\log_a x}$

### EQUACIONS EXPONENCIALS I LOGARITMIQUES

|                          |               |                                                      |
|--------------------------|---------------|------------------------------------------------------|
| $a^x = a^b$              | $\Rightarrow$ | $x = b$                                              |
| $a^{f(x)} = a^b$         | $\Rightarrow$ | $f(x) = b$                                           |
| $a^x = b$                | $\Rightarrow$ | $x = \frac{\log b}{\log a} = \frac{\ln b}{\ln a}$    |
| $a^{f(x)} = b$           | $\Rightarrow$ | $f(x) = \frac{\log b}{\log a} = \frac{\ln b}{\ln a}$ |
| $\log_a x = \log_a b$    | $\Rightarrow$ | $x = b$                                              |
| $\log_a f(x) = \log_a b$ | $\Rightarrow$ | $f(x) = b$                                           |
| $\log_a x = b$           | $\Rightarrow$ | $x = a^b$                                            |
| $\log_a f(x) = b$        | $\Rightarrow$ | $f(x) = a^b$                                         |
| $\log_x a = b$           | $\Rightarrow$ | $x^b = a \rightarrow x = \sqrt[b]{a}$                |
| $\log_{f(x)} a = b$      | $\Rightarrow$ | $f^b(x) = a \rightarrow f(x) = \sqrt[b]{a}$          |

## 1.CALCUL AMB POTÈNCIES

1.1

Simplifiqueu:

|                                                  |                                                    |                                         |
|--------------------------------------------------|----------------------------------------------------|-----------------------------------------|
| a) $3^{x+2} \cdot 9^{x-1} \cdot 3^2$             | b) $2^{x-1} \cdot 2^{x^2-1} \cdot 2^{3-x}$         | c) $\frac{4^{x-2}}{8^{x-1}}$            |
| d) $\frac{3^{x+1} + 3^x}{2 \cdot 9^x}$           | e) $\frac{2^{x+1} + 3 \cdot 2^{x-1}}{4^{x-2}}$     | f) $\frac{e^{x-1} + e^{x+3}}{e^{4x}}$   |
| g) $\frac{4^x \cdot 2^{3-x}}{2^{x+1} + 2^{x-1}}$ | h) $\frac{3^{x+1} \cdot 9^x}{3^x \cdot 3^{x^2+1}}$ | i) $\frac{e^{x+1} - e^{x-2}}{e^{2x-1}}$ |

### RAONAMENT

**Funció exponencial**

i) 
$$\frac{e^{x+1} - e^{x-2}}{e^{2x-1}} = \frac{e^x(e - e^{-2})}{e^{2x}e^{-1}} = e^{-x}(e^2 - e^{-1}) = \frac{e^3 - 1}{e \cdot e^x}$$

Sol:

a)  $3^{3x+2}$

b)  $2^{x^2+1}$

c)  $2^{-x-1}$

d)  $2 \cdot 3^{-x}$

e)  $7 \cdot 2^{3-x}$

f)  $\left(\frac{1}{e} + e^3\right) e^{-3x}$

g)  $\frac{2^4}{3}$

h)  $3^{2x-x^2}$

i)  $(e^3 - 1) e^{-x-1}$

1.2

Calculeu:

a)  $3^{x+2} + 2 \cdot 3^x - 33$  si  $x = 1$

b)  $2^{x-1} - 3 \cdot 2^x + 2^{-1}$  si  $x = 0$

c)  $2^{x+1} - 2^x + 3 \cdot 2^{-2}$  si  $x = -2$

d)  $2^{2-x} - 2^{-x} + 2$  si  $x = -1$

e)  $2^x \cdot 2^{3-2x} + 2^2$  si  $x = 1$

f)  $5^{x-1} \cdot 5^{2x-3}$  si  $x = 3$

**RAONAMENT**

f)  $5^{x-1} \cdot 5^{2x-3}$  si  $x = 3$   $5^2 \cdot 5^3 = 5^5 = 3125$

Sol:

a) 0

b) -2

c) 1

d) 8

e) 8

f) 3125

1.3

Calculeu:

a)  $3^{x+2} + 2 \cdot 3^x - 33$  si  $x \rightarrow \infty$

b)  $2^{x-1} - 3 \cdot 2^x + 2^{-1}$  si  $x \rightarrow \infty$

c)  $2^{x+1} - 2^x + 3 \cdot 2^{-2}$  si  $x \rightarrow \infty$

d)  $2^{2-x} - 2^{-x} + 2$  si  $x \rightarrow \infty$

e)  $2^x \cdot 2^{3-2x} + 2^2$  si  $x \rightarrow \infty$

f)  $5^{x-1} \cdot 5^{2x-3}$  si  $x \rightarrow \infty$

**Funció exponencial****RAONAMENT**

$$f) 5^{x-1} \cdot 5^{2x-3} \text{ si } x \rightarrow \infty$$

$$5^{x-1} \cdot 5^{2x-3} = 5^{3x-4} \text{ si } x \rightarrow \infty \quad 5^{3x-4} = (1/625)5^{3x} \rightarrow \left(\frac{1}{625}\right)5^\infty \rightarrow \infty$$

Sol:

$$a) \infty \quad b) -\infty \quad c) \infty \quad d) 2 \quad e) 4 \quad f) \infty$$

1.4

Calculeu:

$$a) 3^{x+1} + 3^{x-2} + 3^x + 3^{x-1} \text{ si } x=n$$

$$b) 1 + 2 + 4 + \dots + 2^x \text{ si } x = n$$

$$c) 1 + 3 + 9 + 27 + \dots + 3^x \\ \text{si } x = n$$

$$d) 1 + 4 + 16 + 64 + \dots + 4^x \\ \text{si } x = n$$

$$e) 1 + 5 + 25 + 125 + \dots + 5^x \\ \text{si } x = n$$

$$f) 1 + 6 + 36 + 216 + \dots + 6^x \\ \text{si } x = n$$

$$g) 1 + 7 + 49 + 343 + \dots + 7^x \\ \text{si } x = n$$

$$h) 2^x + 2^{x-1} + 2^{x+1} + 2^{x-3} \\ \text{si } x = n$$

**RAONAMENT**

$$h) 2^x + 2^{x-1} + 2^{x+1} + 2^{x-3}$$

$$2^x + 2^{x-1} + 2^{x+1} + 2^{x-3} \text{ si } x = n \quad 2^n \left(1 + \frac{1}{2} + 2 + \frac{1}{8}\right) = 2^n \left(\frac{29}{8}\right)$$

Sol:

$$a) (40/9)3^n \quad b) 2^{n+1}-1 \quad c) (3^{n+1}-1)/2 \quad d) (4^{n+1}-1)/3$$

$$e) (5^{n+1}-1)/4 \quad f) (6^{n+1}-1)/5 \quad g) (7^{n+1}-1)/6 \quad h) (29/8)2^n$$

1.5

Simplifiqueu:

**Funció exponencial**

|                                                                                                                                           |                                                                                                                                                                                          |
|-------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a) $\frac{a^3 b^2 a^{-4} b^5}{a^{-4} b^{-1} a^0 b^3} \cdot \frac{a^{-3} b^3 a^2}{a^7 a^{-3} b^4}$                                         | b) $\frac{6^2 12^2 27^{-2} 16^{-3} \cdot 3^5 12^{-4} 8^3}{4^{-1} 3^5 12^{-1} 6^3 \cdot 4^3 24^{-1} 8^2}$                                                                                 |
| c) $\frac{\left(\frac{5}{3}\right)^{-2} 25^2 3^{-2} 5^{-5}}{\left(\frac{3}{5}\right)^2 75^3 5^{-3} \frac{3^3}{5^2}}$                      | d) $\frac{\left(\frac{3}{2}\right)^{-2} \left(\frac{2}{3}\right)^2 \left(\frac{3}{4}\right)^{-1}}{\left(\frac{1}{3}\right)^4 \left(\frac{-1}{2}\right)^{-4} \left(\frac{1}{9}\right)^3}$ |
| e) $\frac{(2/3)^2 (1/3)^{-3} 2^4 12^3 6^3}{3^2 (2/4)^3 (3^2 8^2 3^3)^{-1}} \cdot \frac{2^4 3^2 4^2}{2^3 3^2 2^6 2 \cdot 3^{-3} 2^{-2} 2}$ | f) $\frac{\frac{3^{-2} 3^2 2^4}{2^2 3} \cdot \frac{2^4 2 2^{-1}}{2^4 3^2 2}}{\frac{2^4 3^{-2}}{2^3 2^4}}$                                                                                |
| g) $\frac{2^4 3^2 2^{-1}}{2^3 3^2 2^6 2} \cdot \frac{2^4 3^2 4^2}{3^{-3} 2^{-2} 2}$                                                       | h) $\frac{\frac{3^2 2^{-1}}{2^7 3^2 18} \cdot \frac{2^4 3^{-2} 4}{2^4 2^{-2} 36}}{3^{-2} 2^4 16} = \frac{2^7}{3^{11}}$                                                                   |

**RAONAMENT**

$$h) \frac{\frac{3^2 2^{-1}}{2^7 3^2 18} \cdot \frac{2^4 3^{-2} 4}{2^4 2^{-2} 36}}{3^{-2} 2^4 16} = \frac{3^{2-6-1-2+2} \cdot 2^{-1+2+4+2+1-4+2}}{3^{2+2+2+2-2} \cdot 2^{7+1-4-4+4-2+2-4-1}} = \frac{2^7}{3^{11}}$$

Sol:

a)  $b^4/a^2$

b)  $1/(2^{13} 3^7)$

c)  $1/(3^8 5^2)$

d)  $3^5 2^2$

e)  $2^{28} 3^7$

f)  $2^7/3^{11}$

g)  $1/(3 2^{16})$

h)  $2^7/3^{11}$

1.6

Simplifiquen:

|                                                                                                                                                                          |                                                                                                                                                                          |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| a) $\frac{(3^{-2} 3^4)^{-1}}{(3^2 3^{-1})^{-2}} \cdot \frac{(2^2 3^{-2})^{-1}}{(3^2 3^3)^{-2}} \cdot \frac{3^4 3^{-1} 2^2}{(2^3 3^2 2)^2} \cdot \frac{(3^2 3)^2}{3^3 2}$ | b) $\frac{(3^{-2} 3^4)^{-1}}{(3^2 3^{-1})^{-2}} \cdot \frac{(2^2 3^{-2})^{-1}}{(3^2 3^3)^{-2}} \cdot \frac{3^4 3^{-1} 2^2}{(2^3 3^2 2)^2} \cdot \frac{(3^2 3)^2}{3^3 2}$ |
| c) $\frac{3^2 3^4 2^6 2}{3^4 2 3^{-1} 27} \cdot \frac{27 2^6 3^{-2}}{15 (2^4)^2 3^{-3}}$                                                                                 | d) $\frac{3^2 3^{-2} 2^4}{2^2 3^{-2} 2^{-3}} \cdot \frac{3^2 2^{-9} 2}{3^2 2^4 3^{-1}}$                                                                                  |

**Funció exponencial**

|                                                                                                                                             |                                                                                                                            |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|
| e) $\frac{27}{(3^2)^{-1}} \cdot \frac{2^4}{2^4} \cdot \frac{81}{9} : \frac{3^4}{2^{-2}} \cdot \frac{2^2}{3^{-1}} \cdot \frac{(2^2)^2}{3^1}$ | f) $\frac{54^2 \cdot 18^3 \cdot 27^{-2} \cdot (3^2)^2}{3^{-3} \cdot 2^4 \cdot 2^3 \cdot 16^{-1} \cdot 18^2 \cdot 24^{-1}}$ |
|---------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------|

Sol:

a)  $3^{10} 2^5$     b)  $2^3 3^{16}$     c)  $5/(2^8 3^7)$     d)  $3^3/2^7$     e)  $3^2$     f)  $3^{10} 2^7$

**2.EQUACIONS**

2.1

Resoleu:

|                        |             |
|------------------------|-------------|
| a) $2^{x+1} = 4^x$     | Sol. $x=1$  |
| b) $2^x = 1/16$        | Sol. $x=-4$ |
| c) $3^{x+1} = 9^{x-2}$ | Sol. $x=5$  |

**RAONAMENT**

$$\boxed{3^{x+1} = 9^{x-2}} \Leftrightarrow 3^{x+1} = 3^{2x-4} \Leftrightarrow x+1 = 2x-4 \Leftrightarrow x=5$$

|                         |               |
|-------------------------|---------------|
| d) $25^x = \sqrt{5}$    | Sol. $x=1/4$  |
| e) $25^x = \frac{1}{5}$ | Sol. $x=-1/2$ |
| f) $3^{x^2-2} = 9$      | Sol. $x=4$    |

**RAONAMENT**

$$\boxed{3^{x^2-2} = 9} \Leftrightarrow 3^{x^2-2} = 3^2 \Leftrightarrow x^2 - 2 = 2 \Leftrightarrow x = 4$$

|                              |              |
|------------------------------|--------------|
| g) $3^{2x-3} = 81$           | Sol. $x=7/2$ |
| h) $2^{x^2-3} = \frac{1}{4}$ | Sol. $x=1$   |

**Funció exponencial**

|                                                                                                                                  |                 |
|----------------------------------------------------------------------------------------------------------------------------------|-----------------|
| i) $3^{x-1} = \sqrt[3]{3}$                                                                                                       | Sol. $x=4/3$    |
| <b>RAONAMENT</b>                                                                                                                 |                 |
| $\boxed{3^{x-1} = \sqrt[3]{3}} \Leftrightarrow 3^{x-1} = 3^{1/3} \Leftrightarrow x-1 = 1/3 \Leftrightarrow x = 4/3$              |                 |
| j) $2^{x+1} = 16^x$                                                                                                              | Sol. $x=1/3$    |
| k) $3^{2x-1} = 81^x$                                                                                                             | Sol. $x = -1/2$ |
| <b>RAONAMENT</b>                                                                                                                 |                 |
| $\boxed{3^{2x-1} = 81^x} \Leftrightarrow 3^{2x-1} = 3^{4x} \Leftrightarrow 2x-1=4x \Leftrightarrow 2x=-1 \Leftrightarrow x=-1/2$ |                 |

2.2

**Resoleu:**

|                                                                                          |              |
|------------------------------------------------------------------------------------------|--------------|
| a) $27^{1/3} = x$                                                                        | Sol. $x=3$   |
| b) $x^{1/2} = 5$                                                                         | Sol. $x=25$  |
| c) $32^x = 2$                                                                            | Sol. $x=1/5$ |
| <b>RAONAMENT</b>                                                                         |              |
| $\boxed{32^x = 2} \Leftrightarrow 2^{5x} = 2 \Leftrightarrow 5x=1 \Leftrightarrow x=1/5$ |              |
| d) $x^{3/2} = 27$                                                                        | Sol. $x=9$   |
| e) $4^x = 32$                                                                            | Sol. $x=5/2$ |
| f) $x^{3/2} = 8$                                                                         | Sol. $x=4$   |
| <b>RAONAMENT</b>                                                                         |              |

**Funció exponencial**

|                                                                                                                                                       |                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| $x^{3/2} = 8 \Leftrightarrow (\sqrt{x})^3 = 2^3 \Leftrightarrow \sqrt{x} = 2 \Leftrightarrow x = 4$                                                   |                 |
| g) $3^{2x} = 27$                                                                                                                                      | Sol. $3/2$      |
| h) $10^x = 0,001$                                                                                                                                     | Sol. $x = -3$   |
| i) $\left(\frac{1}{10}\right)^x = 100$                                                                                                                | Sol. $x = -2$   |
| <b>RAONAMENT</b><br>$10^{-x}(10^2) \Leftrightarrow -x = 2 \Leftrightarrow x = -2$                                                                     |                 |
| j) $3^x = 9^{x+1}$                                                                                                                                    | Sol. $x = -2$   |
| k) $9^{2x} = 27$                                                                                                                                      | Sol. $x = 3/4$  |
| l) $2^{2x} = 8^2$                                                                                                                                     | Sol. $x = 3$    |
| <b>RAONAMENT</b><br>$2^{2x} = 8^2 \Leftrightarrow 2^{2x} = 2^6 \Leftrightarrow 2x = 6 \Leftrightarrow x = 3$                                          |                 |
| m) $10^{3x} = 100$                                                                                                                                    | Sol. $x = 2/3$  |
| n) $10^{2x-1} = 0,01$                                                                                                                                 | Sol. $x = -1/2$ |
| <b>RAONAMENT</b><br>$10^{2x-1} = 0,01 \Leftrightarrow 10^{2x-1} = 10^{-2} \Leftrightarrow 2x-1 = -2 \Leftrightarrow 2x = -1 \Leftrightarrow x = -1/2$ |                 |

2.3

**Resoleu:**

|                        |              |
|------------------------|--------------|
| a) $3^x + 9^{x-1} = 4$ | Sol. $x = 1$ |
|------------------------|--------------|

**Funció exponencial**

|                                                                                                                                                                                                                                                                                                                                                                 |                 |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| b) $3^{2x+3} = 2187$                                                                                                                                                                                                                                                                                                                                            | Sol. $x=2$      |
| c) $3^{\frac{x+1}{x-2}} = \frac{1}{9}$                                                                                                                                                                                                                                                                                                                          | Sol. $x=1$      |
| <b>RAONAMENT</b><br>$\boxed{3^{\frac{x+1}{x-2}} = \frac{1}{9}} \Leftrightarrow 3^{\frac{x+1}{x-2}} = 3^{-2} \Leftrightarrow \frac{x+1}{x-2} = -2 \Leftrightarrow x+1 = -2x+4$ $\Leftrightarrow 3x=3 \Leftrightarrow x=1$                                                                                                                                        |                 |
| d) $3^{x^2-3x+3} = 3$                                                                                                                                                                                                                                                                                                                                           | Sol. $x=1, x=2$ |
| e) $10^{\frac{x^2-1}{x+1}} = 10$                                                                                                                                                                                                                                                                                                                                | Sol. $x=2$      |
| f) $3^{2x-1} - 3^{x+1} = 0$                                                                                                                                                                                                                                                                                                                                     | Sol. $x=2$      |
| <b>RAONAMENT</b><br>$\boxed{3^{2x-1} - 3^{x+1} = 0} \Leftrightarrow (3^x)^2 - 9 \cdot 3^x = 0 \Leftrightarrow 3^x (3^x - 9) = 0 \Leftrightarrow$ $\begin{cases} 3^x = 0 & \text{impossible} \\ 3^x = 9 & x = 2 \end{cases}$                                                                                                                                     |                 |
| g) $5^{2x+1} + 3 \cdot 5^{6x-3} = 500$                                                                                                                                                                                                                                                                                                                          | Sol. $x=1$      |
| h) $4^{x-2} - 2^{x+1} = -12$                                                                                                                                                                                                                                                                                                                                    | Sol. $x=3$      |
| i) $3^{2(x+2)} - 4 \cdot 3^x - 77 = 0$                                                                                                                                                                                                                                                                                                                          | Sol. $x=0$      |
| <b>RAONAMENT</b><br>$\boxed{3^{2(x+2)} - 4 \cdot 3^x - 77 = 0} \Leftrightarrow 81 \cdot (3^x)^2 - 4 \cdot 3^x - 77 = 0 \Leftrightarrow$ $3^x = \frac{4 \pm \sqrt{16 + 24948}}{162} = \frac{4 \pm 158}{162} = \begin{cases} \frac{1}{154} \\ -\frac{154}{162} \end{cases} \Leftrightarrow \begin{cases} 3^x = 1 & x = 0 \\ 3^x < 0 & \text{cap. } x \end{cases}$ |                 |

**Funció exponencial****Resoleu:**

a)  $3^{x+2} + 2 \cdot 3^x - 33 = 0$

Sol.  $x=1$

b)  $2^{x-1} - 3 \cdot 2^x + 2^{-1} = -2$

Sol.  $x=0$

c)  $2^{x+1} - 2^x + 3 \cdot 2^{-2} = 1$

Sol.  $x=-2$

**RAONAMENT**

$$\boxed{2^{x+1} - 2^x + 3 \cdot 2^{-2} = 1} \Leftrightarrow 2^x(2 - 1) = 1 - 3/4 \Leftrightarrow 2^x = 1/4 \Leftrightarrow 2^x = 2^{-2} \Leftrightarrow x = -2$$

d)  $2^{2-x} - 2^{-x} + 2 = 2^3$

Sol.  $x=-1$

e)  $2^x \cdot 2^{3-2x} + 2^2 = 2^3$

Sol.  $x=1$

f)  $5^{x-1} \cdot 5^{2x-3} = 3125$

Sol.  $x=3$

**RAONAMENT**

$$\boxed{5^{x-1} \cdot 5^{2x-3} = 3125} \Leftrightarrow \frac{5^{3x}}{5^4} = 5^5 \Leftrightarrow 5^{3x} = 5^9 \Leftrightarrow 3x = 9 \Leftrightarrow x = 3$$

**2.5****Resoleu:**

a)  $e^{x-2} = e^{2(x-1)}$

Sol.  $x=0$

b)  $4^{x+1} = 2^{2x-3}$

Sol.  $x = \text{no té sol.}$

c)  $2^{x-1} = 8^{x-3}$

Sol.  $x=4$

**RAONAMENT**

$$\boxed{2^{x-1} = 8^{x-3}} \Leftrightarrow 2^{x-1} = 2^{3x-9} \Leftrightarrow x-1 = 3x-9 \Leftrightarrow 2x = 8 \Leftrightarrow x = 4$$

**Funció exponencial**

|                                                                                                             |                  |
|-------------------------------------------------------------------------------------------------------------|------------------|
| d) $3^{2x+1} - 9^{x+2} = -702$                                                                              | Sol. $x=1$       |
| e) $5^{3x-2} = 625$                                                                                         | Sol. $x=2$       |
| f) $5^{x^2-x-6} = 1$                                                                                        | Sol. $x=-2, x=3$ |
| <b>RAONAMENT</b>                                                                                            |                  |
| $5^{x^2-x-6} = 1 \Leftrightarrow x^2 - x - 6 = 0 \Leftrightarrow \begin{cases} x = -2 \\ x = 3 \end{cases}$ |                  |
| g) $3^{2x-1} - 3^{2x} = -54$                                                                                | Sol. $x=2$       |
| h) $4^x - 2^{x+2} = 32$                                                                                     | Sol. $x=3$       |
| i) $5^{x-2} = 25^{x-3}$                                                                                     | Sol. $x=4$       |
| <b>RAONAMENT</b>                                                                                            |                  |
| $5^{x-2} = 25^{x-3} \Leftrightarrow 5^{x-2} = 5^{2(x-3)} \Leftrightarrow x-2 = 2x-6 \Leftrightarrow x=4$    |                  |

2.6

**Resoleu:**

|                                                                                                                                                                                                          |             |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------|
| a) $3^{2x+5} = 27^{x+2}$                                                                                                                                                                                 | Sol. $x=-1$ |
| b) $2^{-x+5} = 8^{x+3}$                                                                                                                                                                                  | Sol. $x=-1$ |
| c) $4^x + 2^{x-1} = \frac{1}{2}$                                                                                                                                                                         | Sol. $x=-1$ |
| <b>RAONAMENT</b>                                                                                                                                                                                         |             |
| $4^x + 2^{x-1} = \frac{1}{2} \Leftrightarrow 2 \cdot 4^x + 2^x = 1 \Leftrightarrow 2 \cdot (2^x)^2 + 2^x - 1 = 0 \Leftrightarrow$ $\begin{cases} 2^x = -1 & \text{no} \\ 2^x = 1/2 & x = -1 \end{cases}$ |             |

**Funció exponencial**

|                                              |            |
|----------------------------------------------|------------|
| d) $3^{x+1} + 3^{x-2} + 3^x + 3^{x-1} = 120$ | Sol. $x=3$ |
| e) $1 + 2 + 4 + 8 + \dots + 2^x = 511$       | Sol. $x=8$ |
| f) $1 + 3 + 9 + 27 + \dots + 3^x = 3280$     | Sol. $x=7$ |

**RAONAMENT**

$$1 + 3 + 9 + 27 + \dots + 3^x = 3280 \Leftrightarrow \frac{3^{x+1} - 1}{3 - 1} = 3280$$

$$\Leftrightarrow 3^{x+1} = 2(3280) + 1 \Leftrightarrow 3^{x+1} = 3^8 \Leftrightarrow x+1 = 8 \Leftrightarrow x = 7$$

|                                             |            |
|---------------------------------------------|------------|
| g) $1 + 4 + 16 + 64 + \dots + 4^x = 1365$   | Sol. $x=5$ |
| h) $1 + 5 + 25 + 125 + \dots + 5^x = 19531$ | Sol. $x=6$ |
| i) $1 + 6 + 36 + 216 + \dots + 6^x = 55987$ | Sol. $x=6$ |

**RAONAMENT**

$$1 + 6 + 36 + 216 + \dots + 6^x = 55987 \Leftrightarrow \frac{6^{x+1} - 1}{6 - 1} = 55987$$

$$\Leftrightarrow 6^{x+1} = 5(55987) + 1 \Leftrightarrow 6^{x+1} = 6^7 \Leftrightarrow x+1 = 7 \Leftrightarrow x = 6$$

|                                             |            |
|---------------------------------------------|------------|
| j) $1 + 7 + 49 + 343 + \dots + 7^x = 19608$ | Sol. $x=5$ |
| k) $2^x + 2^{x-1} + 2^{x+1} + 2^{x-3} = 29$ | Sol. $x=3$ |

**RAONAMENT**

$$2^x + 2^{x-1} + 2^{x+1} + 2^{x-3} = 29 \Leftrightarrow 2^x(1 + 1/2 + 2 + 1/8) = 29$$

$$\Leftrightarrow 2^x(29/8) = 29 \Leftrightarrow 2^x = 8 \Leftrightarrow 2^x = 2^3 \Leftrightarrow x = 3$$

**Funció exponencial**

|                                                                                                             |             |
|-------------------------------------------------------------------------------------------------------------|-------------|
| <b>Resoleu:</b>                                                                                             |             |
| a) $3 \cdot 3^x = 27$                                                                                       | Sol. $x=2$  |
| b) $5 \cdot 3^x = 405$                                                                                      | Sol. $x=4$  |
| c) $2^x/4=4$                                                                                                | Sol. $x=4$  |
| d) $4^{2x+1}=1/4$                                                                                           | Sol. $x=-1$ |
| <b>RAONAMENT</b>                                                                                            |             |
| $4^{2x+1} = \frac{1}{4} \Leftrightarrow 4^{2x+1} = 4^{-1} \Leftrightarrow 2x+1 = -1 \Leftrightarrow x = -1$ |             |

2.8

**Resoleu:**

|                                            |               |
|--------------------------------------------|---------------|
| a) $2^{x^2} = 16$                          | Sol. $x=2$    |
| b) $3^{x-3} = 81$                          | Sol. $x=7$    |
| c) $\sqrt{3^x} = \frac{1}{9}$              | Sol. $x=-4$   |
| d) $\left(\frac{1}{3}\right)^x = \sqrt{3}$ | Sol. $x=-1/2$ |

**RAONAMENT**

$$\left(\frac{1}{3}\right)^x = \sqrt{3} \Leftrightarrow 3^{-x} = 3^{1/2} \Leftrightarrow -x = 1/2 \Leftrightarrow x = -1/2$$

2.9

**Funció exponencial****Resoleu:**

a)  $2^{2x} - 3 \cdot 2^x - 4 = 0$

Sol.  $x=2$

b)  $3^x + 3^{x-1} - 3^{x-2} = 11$

Sol.  $x=2$

c)  $2^x + 2^{-x} = 65/8$

Sol.  $x=3, x=-3$

**RAONAMENT**

$$2^x + 2^{-x} = \frac{65}{8} \Leftrightarrow 2^x + \frac{1}{2^x} = \frac{65}{8} \Leftrightarrow 8(2^x)^2 + 8 = 65 \cdot 2^x$$

$$\Leftrightarrow 8(2^x)^2 - 65 \cdot 2^x + 8 = 0 \Leftrightarrow 2^x = \frac{65 \pm \sqrt{4225 - 256}}{16} = \frac{65 \pm 63}{16}$$

$$\Leftrightarrow \begin{cases} 2^x = 8 & x=3 \\ 2^x = \frac{1}{8} & x=-3 \end{cases}$$

**2.10****Resoleu:**

a)  $3^{x+2} = 729$

b)  $2^{3x-2} = 16$

c)  $5^x + 5^{x+1} = 750$

d)  $1000^{2+x} = 1$

**RAONAMENT**

$$1000^{(2+x)} \Leftrightarrow 2+x=0 \Leftrightarrow x = -2$$

**Sol:**

a)  $x=4$

b)  $x=2$

c)  $x=3$

d)  $x=-2$

**2.11****Resoleu:**

a)  $2^{2x+1} = 8^{x-1}$

b)  $3^{x-1} = 3^{x^2-1}$

c)  $\frac{2^{3x+1}}{2^{x^2}} = \frac{4^x}{2^5}$

**Funció exponencial****RAONAMENT**

$$\frac{2^{3x+1}}{2^{x^2}} = \frac{4^x}{2^5} \Leftrightarrow 2^{3x+1-x^2} = 2^{2x-5} \Leftrightarrow 3x+1-x^2=2x-5 \Leftrightarrow$$

$$x^2 - x - 6 = 0 \Leftrightarrow \begin{cases} x = 3 \\ x = -2 \end{cases}$$

**Sol:**

a)  $x=4$

b)  $x=0$  ,  $x=1$

c)  $x=3$  ,  $x=-2$

**2.12****Resoleu:**

a)  $2^{x+1} = 4^x$

b)  $3^{x+2} = 9$

c)  $4^{x-1} = 2^{x+1}$

d)  $25^{x+2} = 5^{-x-2}$

**RAONAMENT**

$$\frac{25^{x+2}}{5^{-x-2}} = 5^{-x-2} \Leftrightarrow 5^{2x+4} = 5^{-x-2} \Leftrightarrow 2x+4 = -x-2 \Leftrightarrow 3x = -6$$

$$\Leftrightarrow x = -2$$

e)  $3^{x-1} + 3^x - 3^{x+1} = -45$

f)  $3^{x+1} - 3^x - 2 \cdot 3^{x-1} = 12$

g)  $2^{3x} - 2^{2x} - 4 = 0$

h)  $3^{2x+1} - 12 \cdot 3^x + 3^2 = 0$

**RAONAMENT**

$$3^{2x+1} - 12 \cdot 3^x + 3^2 = 0 \Leftrightarrow 3 \cdot (3^x)^2 - 12 \cdot 3^x + 9 = 0 \Leftrightarrow$$

$$(3^x)^2 - 4 \cdot 3^x + 3 = 0 \Leftrightarrow 3^x = \frac{4 \pm \sqrt{16-12}}{2} = \begin{cases} 3 \\ 1 \end{cases} \Leftrightarrow \begin{cases} x = 1 \\ x = 0 \end{cases}$$

**Sol:**

a)  $x=1$

b)  $x=0$

d)  $x=-2$

e)  $x=3$

f)  $x=2$

g)  $x=1$

h)  $x=0$

h)  $x=0$  ,  $x=1$

**2.13****Resoleu:**

a)  $2^{x-1} + 2^x - 2^{x+1} = -4$

b)  $5^x + 5^{x+1} - \frac{1}{5} = 1$

c)  $32^x = \sqrt[3]{2^2}$

**Funció exponencial**

|                                                                                                                                                                                                 |                                               |                             |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|-----------------------------|
| $d) 3^{x+1} \cdot 3^x = \frac{1}{27}$                                                                                                                                                           | $e) 3^{x-1} + \frac{1}{3} = 2 \cdot 3^{2x-1}$ | $f) a^{2x-3} = \sqrt[3]{a}$ |
| <b>RAONAMENT</b><br>$\begin{aligned} a^{2x-3} = \sqrt[3]{a} &\Leftrightarrow a^{2x-3} = a^{1/3} \Leftrightarrow 2x-3 = 1/3 \Leftrightarrow 2x = 10/3 \\ &\Leftrightarrow x = 5/3 \end{aligned}$ |                                               |                             |

**Sol:**

a)  $x=3$     b)  $x=-1$     c)  $x=2/15$     d)  $x=-2$     e)  $x=0$     f)  $x=5/3$

**3.SISTEMES**

|                                                                                                |                  |
|------------------------------------------------------------------------------------------------|------------------|
| <div style="border: 1px solid black; padding: 5px; display: inline-block;">3.1</div>           |                  |
| <b>Resoleu:</b>                                                                                |                  |
| a) $\begin{cases} 2^x + 2^y = 5 \\ 2^{x-y} = \frac{1}{4} \end{cases}$                          | Sol. $x=0, y=2$  |
| b) $\begin{cases} 3^x + 2^y = 7 \\ 3^x + 2^{2y} = 19 \end{cases}$                              | Sol. $x=1, y=2$  |
| c) $\begin{cases} 2^{x-y} = 4 \\ 2^{3x+y} = 4 \end{cases}$                                     | Sol. $x=1, y=-1$ |
| d) $\begin{cases} 2^{2x-1} - 3^y = 7 \\ 2^{x+1} + 3^y = 9 \end{cases}$                         | Sol. $x=2, y=0$  |
| e) $\begin{cases} 3 \cdot 2^{x+y} = 12 \\ 2 \cdot 2^x - 2^y = 7 \end{cases}$                   | Sol. $x=2, y=0$  |
| f) $\begin{cases} 3 \cdot 2^{x+1} - 2 \cdot 3^{y+1} = 10 \\ 2^x - 3 \cdot 3^y = 1 \end{cases}$ | Sol. $x=1, y=-1$ |
| <b>RAONAMENT</b>                                                                               |                  |

**Funció exponencial**

$$\left\{ \begin{array}{l} 3 \cdot 2^{x+1} - 2 \cdot 3^{y+1} = 10 \\ 2^x - 3 \cdot 3^y = 1 \end{array} \right\} \Leftrightarrow \left\{ \begin{array}{l} 6 \cdot 2^x - 6 \cdot 3^y = 10 \\ 1 \cdot 2^x - 3 \cdot 3^y = 1 \end{array} \right\} \Leftrightarrow \left\{ \begin{array}{ll} 2^x = 2 & x = 1 \\ 3^y = \frac{1}{3} & y = -1 \end{array} \right.$$

**3.2****Resoleu:**

|                                                               |                                  |
|---------------------------------------------------------------|----------------------------------|
| a) $\begin{cases} 2^x + 2^y = 6 \\ 2^{x+y} = 8 \end{cases}$   | Sol.<br>$x=2, y=1$<br>$x=1, y=2$ |
| b) $\begin{cases} 3^{x+y} = 2187 \\ 3^{x-y} = 27 \end{cases}$ | Sol.<br>$x=5, y=5$               |

**3.3****Resoleu:**

|                                                                             |                     |
|-----------------------------------------------------------------------------|---------------------|
| a) $\begin{cases} 3x + 2y = -1 \\ 2^{x+y} = \frac{1}{2} \end{cases}$        | Sol.<br>$x=1, y=-2$ |
| b) $\begin{cases} 3^{x-1} - 3^{-y} = \frac{2}{9} \\ 2x + y = 2 \end{cases}$ | Sol.<br>$x=0, y=2$  |
| c) $\begin{cases} 2^x + 3^{2y} = 11 \\ 2^{x+1} - 3^y = 1 \end{cases}$       | Sol.<br>$x=1, y=1$  |
| d) $\begin{cases} 2^{x/2} \cdot 8^y = 2 \\ 2^{x-y} = 4 \end{cases}$         | Sol.<br>$x=2, y=0$  |

**Funció exponencial**

|                                                                                                                                                                                                                                                                                                                                                                                                                         |                    |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
| e) $\begin{cases} 3^x + 5^y = 14 \\ 3^x - 5^y = 47 \end{cases}$                                                                                                                                                                                                                                                                                                                                                         | Sol.<br>$x=2, y=1$ |
| f) $\begin{cases} 2 \cdot 3^x - 3^{y-2} = 5 \\ 3^x \cdot 3^y = 27 \end{cases}$                                                                                                                                                                                                                                                                                                                                          | Sol.<br>$x=1, y=2$ |
| <b>RAONAMENT</b><br>$\begin{cases} 2 \cdot 3^x - 3^{y-2} = 5 \\ 3^x \cdot 3^y = 27 \end{cases} \Leftrightarrow \begin{cases} 2 \cdot 3^x - \frac{1}{9} \cdot 3^y = 5 \\ 3^{x+y} = 3^3 \end{cases} \Leftrightarrow y = 3 - x$ $\Leftrightarrow 2 \cdot 3^x - 3^{1-x} = 5 \Leftrightarrow 2 \cdot (3^x)^2 - 3 = 5 \cdot 3^x$ $\Leftrightarrow \begin{cases} 3^x = 3 & x=1 \\ 3^x = -0'5 & \text{cap} \end{cases} ; y = 2$ |                    |

3.4

**Resoleu:**

|                                                                                                 |                 |
|-------------------------------------------------------------------------------------------------|-----------------|
| a) $\begin{cases} x - y = 1 \\ 2^x - 2^y = 2 \end{cases}$                                       | Sol. $x=2, y=1$ |
| b) $\begin{cases} 2^x - 3^y = 1 \\ 2^{x+2} - 3^{y+1} = 5 \end{cases}$                           | Sol. $x=1, y=0$ |
| c) $\begin{cases} 3 \cdot 2^x + 2 \cdot 3^y = 21 \\ 3^{y+2} - 2 \cdot 2^{x-1} = 80 \end{cases}$ | Sol. $x=0, y=2$ |
| d) $\begin{cases} 2^{3x-2y} = \frac{1}{2} \\ 3^{y+x} = 27 \end{cases}$                          | Sol. $x=1, y=2$ |

**Funció exponencial**

|                                                                                                                                                                                                                                                                                           |                  |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|
| e) $\begin{cases} 5^x \cdot 25^{2x} = 5^{y+2} \\ 3^{2x} \cdot 3^{2y} = 81^2 \end{cases}$                                                                                                                                                                                                  | Sol. $x=1, y=3$  |
| f) $\begin{cases} 3^{x+1} - 2^{y+1} = -3 \\ 2^y - 2 \cdot 3^{x+2} = -4 \end{cases}$                                                                                                                                                                                                       | Sol. $x=-1, y=1$ |
| <b>RAONAMENT</b><br>$\begin{cases} 3^{x+1} - 2^{y+1} = -3 \\ 2^y - 2 \cdot 3^{x+2} = -4 \end{cases} \rightarrow \begin{cases} 3 \cdot 3^x - 2 \cdot 2^y = -3 \\ -18 \cdot 3^x + 1 \cdot 2^y = -4 \end{cases} \rightarrow \begin{cases} 3^x = 1/3 & x = -1 \\ 2^y = 2 & y = 1 \end{cases}$ |                  |

3.5

**Resoleu:**

|                                                                                   |                                  |
|-----------------------------------------------------------------------------------|----------------------------------|
| a) $\begin{cases} 3^{x+y} = 81 \\ 3^{y-x} = 9 \end{cases}$                        | Sol. $x=1, y=3$                  |
| b) $\begin{cases} 3^x + 3^y = 36 \\ 3^{y-x} = 3 \end{cases}$                      | Sol. $x=2, y=3$                  |
| c) $\begin{cases} 2^x + 2^y = 20 \\ 2^{y+x} = 64 \end{cases}$                     | Sol.<br>$x=4, y=2$<br>$x=2, y=4$ |
| d) $\begin{cases} 2^x + 3^y = 7 \\ 2^{2x+1} - 3^{2y} = 23 \end{cases}$            | Sol. $x=2, y=1$                  |
| e) $\begin{cases} 2^{2x-y} = 32 \\ 3^{x-2y} = 3 \end{cases}$                      | Sol. $x=3, y=1$                  |
| f) $\begin{cases} 3^x \cdot 9^y = 3^8 \\ 2^{x-1} \cdot 2^{y+1} = 2^6 \end{cases}$ | Sol. $x=4, y=2$                  |

**Funció exponencial**

|                                                                                                                                                                                                                                                                                            |                        |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------|
| $g) \begin{cases} 2 \cdot 3^{x+1} - 3^{y-1} = 15 \\ 5 \cdot 3^{x+2} - 3^{y+1} = 108 \end{cases}$                                                                                                                                                                                           | <i>Sol.</i> $x=1, y=2$ |
| $h) \begin{cases} 3 \cdot 2^x - 2 \cdot 3^y = -42 \\ 5 \cdot 2^{x+1} - 4 \cdot 3^{y-1} = 4 \end{cases}$                                                                                                                                                                                    | <i>Sol.</i> $x=2, y=3$ |
| $i) \begin{cases} 2 \cdot 5^x - 2 \cdot 3^{y+2} = 32 \\ 5^x + 3^{y+1} = 28 \end{cases}$                                                                                                                                                                                                    | <i>Sol.</i> $x=2, y=0$ |
| <b>RAONAMENT</b><br>$\begin{cases} 2 \cdot 5^x - 2 \cdot 3^{y+2} = 32 \\ 5^x + 3^{y+1} = 28 \end{cases} \rightarrow \begin{cases} 2 \cdot 5^x - 18 \cdot 3^y = 32 \\ 1 \cdot 5^x + 3 \cdot 3^y = 28 \end{cases} \rightarrow \begin{cases} 5^x = 25 & x = 2 \\ 3^y = 1 & y = 0 \end{cases}$ |                        |

**4.REPRESENTACIÓ GRÀFICA**

|                                                                                      |                |              |                  |
|--------------------------------------------------------------------------------------|----------------|--------------|------------------|
| <div style="border: 1px solid black; padding: 5px; display: inline-block;">4.1</div> |                |              |                  |
| Representeu gràficament les següents funcions:                                       |                |              |                  |
| a) $y=2^x$                                                                           | b) $y=2^{x+1}$ | c) $y=2^x-5$ | d) $y=2^{x+1}-5$ |

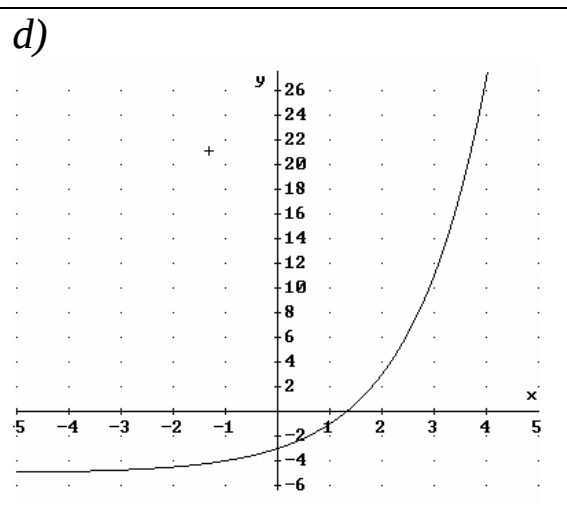
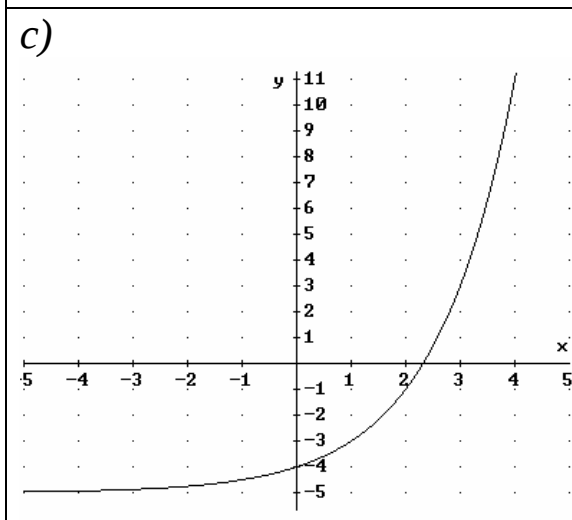
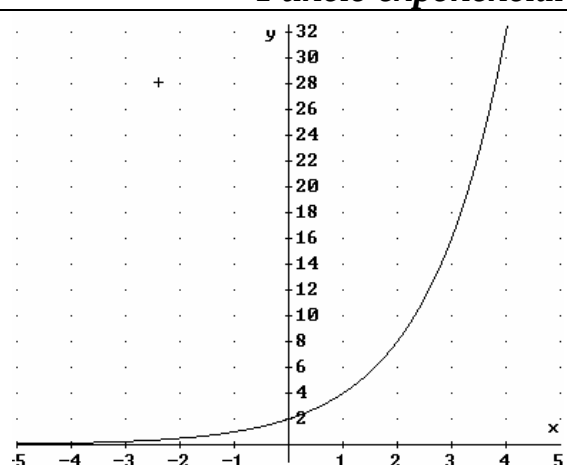
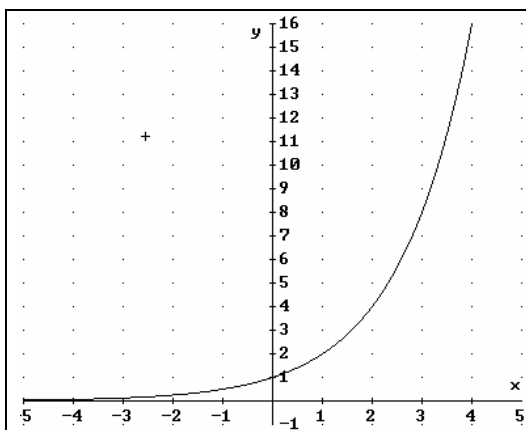
*Sol.*

|   |               |                   |             |          |          |
|---|---------------|-------------------|-------------|----------|----------|
| a | $y=2^x$       | $y=2^x$           | $(-1,0'5)$  | $(0,1)$  | $(1,2)$  |
| b | $y=2^{x+1}$   | $y=2 \cdot 2^x$   | $(-1,1)$    | $(0,2)$  | $(1,4)$  |
| c | $y=2^x-5$     | $y=2^x-5$         | $(-1,-4'5)$ | $(0,-4)$ | $(1,-2)$ |
| d | $y=2^{x+1}-5$ | $y=2 \cdot 2^x-5$ | $(-1,-4)$   | $(0,-3)$ | $(1,-1)$ |

|    |    |
|----|----|
| a) | b) |
|----|----|



## Funció exponencial



4.2

Representeu gràficament les següents funcions:

a)  $y = 2^{3x}$

b)  $y = 2^{3x+1}$

c)  $y = 2^{3x} - 5$

d)  $y = 2^{3x+1} - 5$

Sol.

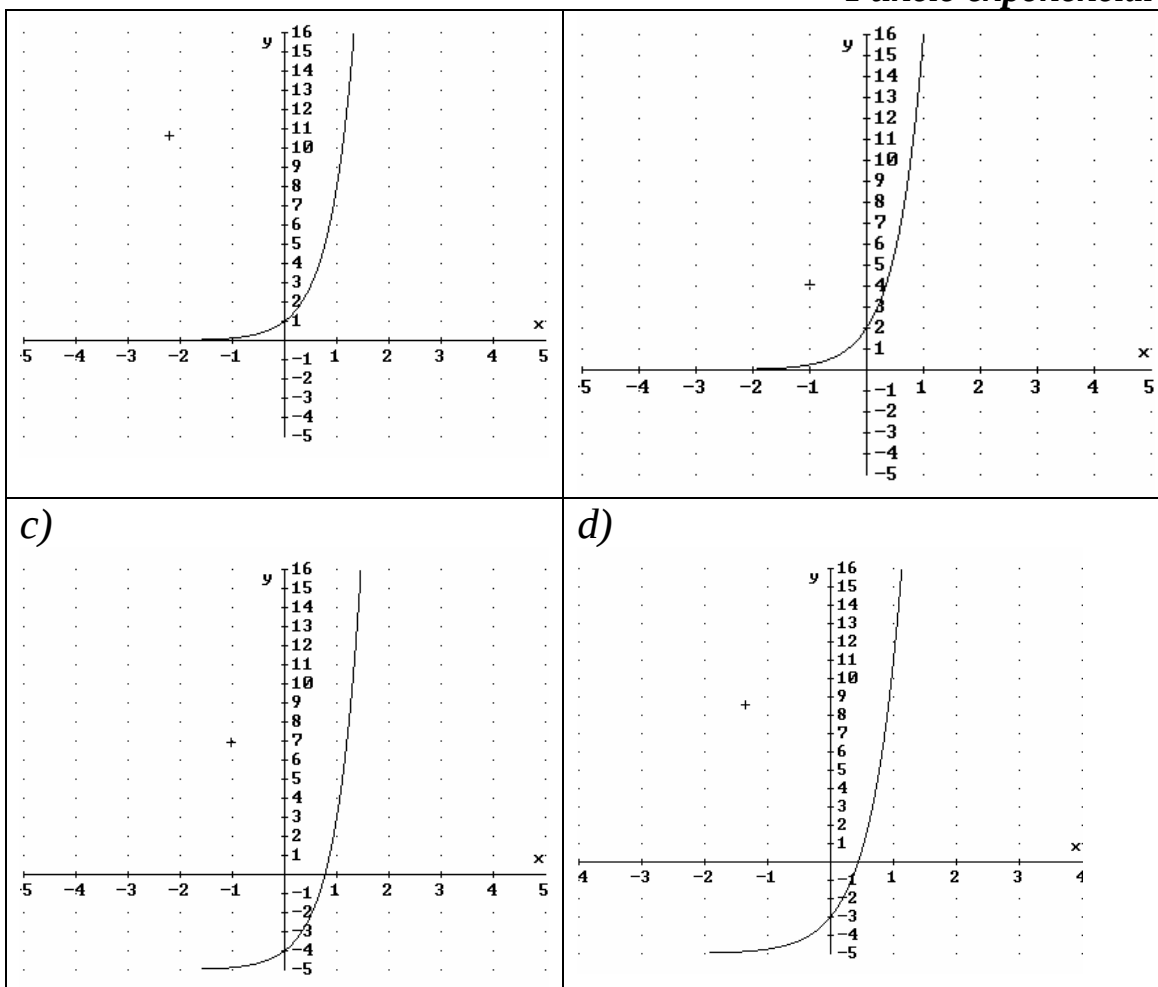
|   |                    |                       |                |           |           |
|---|--------------------|-----------------------|----------------|-----------|-----------|
| a | $y = 2^{3x}$       | $y = 8^x$             | $(-1, 0,125)$  | $(0, 1)$  | $(1, 8)$  |
| b | $y = 2^{3x+1}$     | $y = 2 \cdot 8^x$     | $(-1, 0,25)$   | $(0, 2)$  | $(1, 16)$ |
| c | $y = 2^{3x} - 5$   | $y = 8^x - 5$         | $(-1, -4,875)$ | $(0, -4)$ | $(1, 3)$  |
| d | $y = 2^{3x+1} - 5$ | $y = 2 \cdot 8^x - 5$ | $(-1, -4,75)$  | $(0, -3)$ | $(1, 11)$ |

a)

b)



## Funció exponencial



4.3

Representeu gràficament les següents funcions:

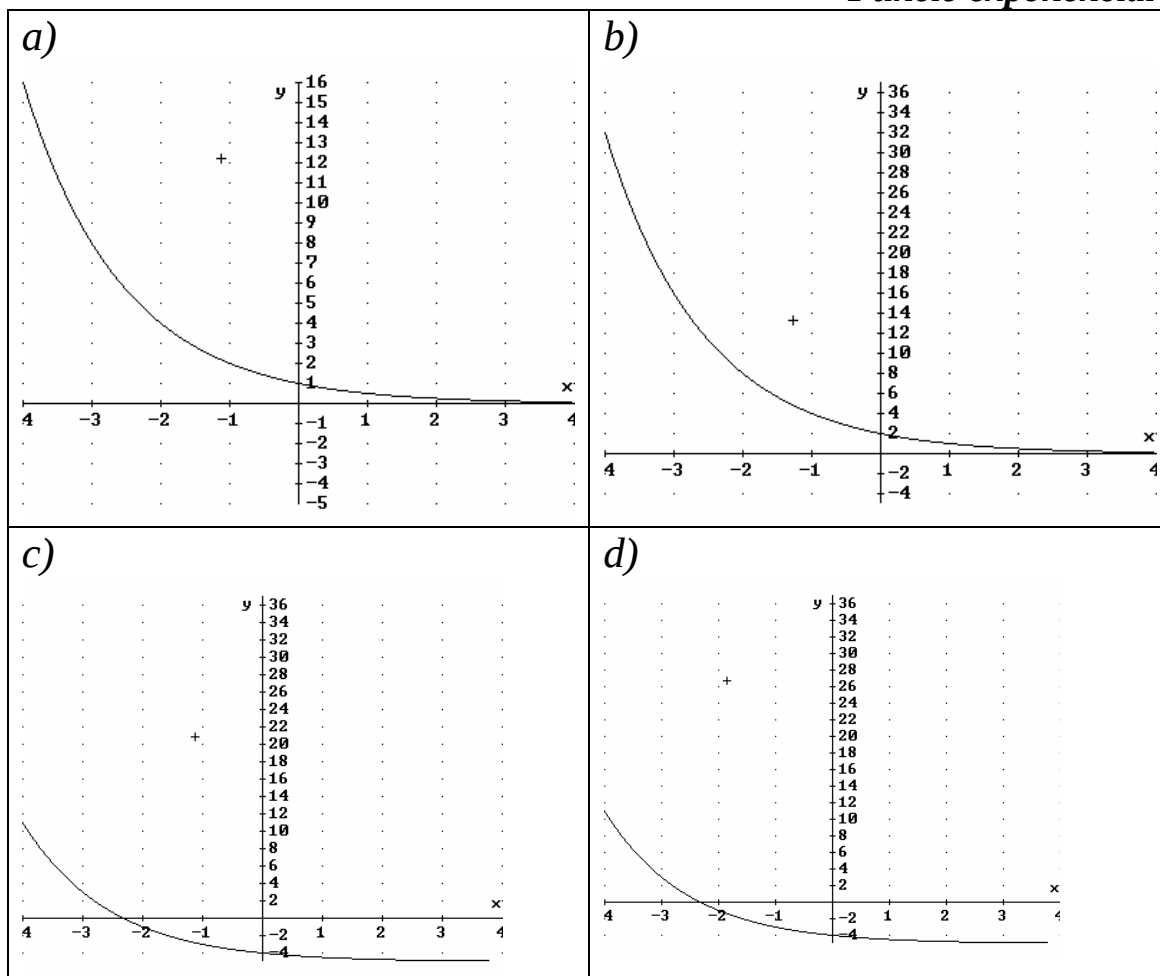
|               |                 |                 |                   |
|---------------|-----------------|-----------------|-------------------|
| a) $y=2^{-x}$ | b) $y=2^{-x+1}$ | c) $y=2^{-x}-5$ | d) $y=2^{-x+1}-5$ |
|---------------|-----------------|-----------------|-------------------|

Sol.

|   |                |                      |                                          |           |          |            |
|---|----------------|----------------------|------------------------------------------|-----------|----------|------------|
| a | $y=2^{-x}$     | $y=2^{-x}$           | $y=\left(\frac{1}{2}\right)^x$           | $(-1,2)$  | $(0,1)$  | $(1,0,5)$  |
| b | $y=2^{-x+1}$   | $y=2 \cdot 2^{-x}$   | $y=2 \cdot \left(\frac{1}{2}\right)^x$   | $(-1,4)$  | $(0,2)$  | $(1,1)$    |
| c | $y=2^{-x}-5$   | $y=2^{-x}-5$         | $y=\left(\frac{1}{2}\right)^x-5$         | $(-1,-2)$ | $(0,-4)$ | $(1,-4,5)$ |
| d | $y=2^{-x+1}-5$ | $y=2 \cdot 2^{-x}-5$ | $y=2 \cdot \left(\frac{1}{2}\right)^x-5$ | $(-1,-1)$ | $(0,-3)$ | $(1,-4)$   |



## Funció exponencial



## 5.INEQUACIONS

5.1

Resoleu:

a)  $3^{x+2} + 2 \cdot 3^x - 33 > 0$

b)  $2^{x-1} - 3 \cdot 2^x + 2^{-1} < -2$

c)  $2^{x+1} - 2^x + 3 \cdot 2^{-2} > 1$

d)  $2^{2-x} - 2^{-x} + 2 < 2^3$

e)  $2^x \cdot 2^{3-2x} + 2^2 > 2^3$

f)  $5^{x-1} \cdot 5^{2x-3} < 3125$

Sol:

a)  $x > 1$

b)  $x > 0$

c)  $x > -2$

d)  $x > -1$

e)  $x < 1$

f)  $x < 3$

5.2

**Funció exponencial****Resoleu:**

a)  $3 \cdot 3^x > 27$

b)  $5 \cdot 3^x < 405$

c)  $2^x/4 > 4$

d)  $4^{2x+1} < 1/4$

**Sol:**

a)  $x > 2$

b)  $x > 4$

c)  $x > 4$

d)  $x < -1$

**5.3****Resoleu:**

a)  $2^{2x} - 3 \cdot 2^x - 4 > 0$

b)  $3^x + 3^{x-1} - 3^{x-2} < 11$

c)  $2^x + 2^{-x} > 65/8$

**Sol:**

a)  $x > 2$

b)  $x < 2$

c)  $\mathbb{R} - [-3, 3]$

**5.4****Resoleu:**

a)  $3^{x+2} > 729$

b)  $2^{3x-2} < 16$

c)  $5^x + 5^{x+1} > 750$

d)  $1000^{2+x} < 1$

**Sol:**

a)  $x > 4$

b)  $x < 2$

c)  $x > 3$

d)  $x < -2$

**5.5****Resoleu:**

a)  $2^{x+1} \geq 4^x$

b)  $3^{x+2} \leq 9$

c)  $4^{x-1} \geq 2^{x+1}$

d)  $25^{x+2} \leq 5^{-x-2}$

e)  $3^{x-1} + 3^x - 3^{x+1} \geq -45$

f)  $3^{x+1} - 3^x - 2 \cdot 3^{x-1} \leq 12$

g)  $2^{3x} - 2^{2x} - 4 \geq 0$

h)  $3^{2x+1} - 12 \cdot 3^x + 3^2 \leq 0$

**Sol:**

a)  $x \leq 1$

b)  $x \leq 0$

c)  $x \geq 3$

d)  $x \leq -2$

e)  $x \leq 3$

f)  $x \leq 2$

g)  $x \geq 1$

h)  $0 \leq x \leq 1$