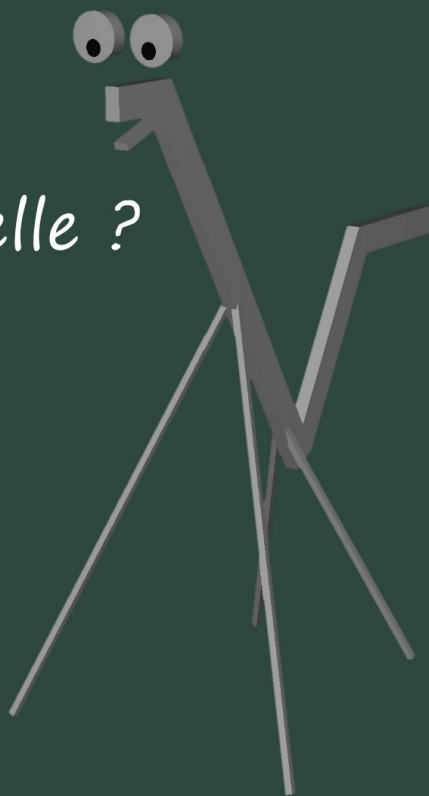


$$16^x + 20^x = 25^x$$

*Une petite
équation
exponentielle ?*





$$16^x + 20^x = 25^x$$

$$x = ?$$

RAISONNEMENT

$$16^x + 20^x = 25^x$$

$$16^x + 20^x - 25^x = 0$$

$$16^x[1 + (20/16)^x - (25/16)^x] = 0$$

$$16^x[1 + (5/4)^x - (25/16)^x] = 0$$

$$16^x = 0 \Rightarrow \text{pas de solution pour } x$$

$$1 + (5/4)^x - (25/16)^x = 0$$

$$1 + (5/4)^x - ((5/4)^2)^x = 0$$

rappel: $(n^a)^b = (n^b)^a$

$$1 + (5/4)^x - ((5/4)^x)^2 = 0$$

$$(-1) * (1 + (5/4)^x - ((5/4)^x)^2) = (-1) * 0$$

$$((5/4)^x)^2 - (5/4)^x - 1 = 0$$

$$\text{soit } k = (5/4)^x \text{ alors } ((5/4)^x)^2 - (5/4)^x - 1 = 0$$

... devient:

$$k^2 - k - 1 = 0$$

$$\text{delta} = (-1)^2 - 4 \cdot 1 \cdot -1 = 1 + 4 = 5$$

$$\text{racine \#1 de k: } k = (-(-1) + \sqrt{5})/2 \cdot 1 = (1 + \sqrt{5})/2$$

$$\text{racine \#2 de k: } k = (-(-1) - \sqrt{5})/2 \cdot 1 = (1 - \sqrt{5})/2$$

$$k = (5/4)^x$$

racine #1 de x:

$$(5/4)^x = (1 + \sqrt{5})/2$$

$$\log((5/4)^x) = \log((1 + \sqrt{5})/2)$$

$$x \cdot \log(5/4) = \log((1 + \sqrt{5})/2)$$

$$x = [\log((1 + \sqrt{5})/2)] / \log(5/4)$$

$$x = 2,15651$$

racine #2 de x:

$$(5/4)^x = (1 - \sqrt{5})/2$$

$$\log((5/4)^x) = \log((1 - \sqrt{5})/2)$$

$$\log((1 - \sqrt{5})/2) < 0 \Rightarrow \text{pas de solution}$$

RÉSULTAT(S)

$$x = [\log((1 + \sqrt{5})/2)] / \log(5/4) = 2,15651$$