

# Méchants bons problèmes FTS EXPONENTIELLES ET LOGARITHMIQUES

#1 a)  $6, 18, 54, 162, \underline{486}, \underline{1458}, \underline{4374}$  (RAISON ou facteur multiplicatif est 3)

b)  $2916, 324, 36, \underline{4}, \underline{\frac{4}{9}}, \underline{\frac{4}{81}}$  (RAISON ou facteur multiplicatif est  $\frac{1}{9}$ )

#2 a)  $13, \underline{65}, \underline{325}, 1625$  : Valeur du  $n^{\text{ième}}$  terme =  $V.i (RAISON)^{n-1}$   
 $1625 = 13 \cdot C^3$   
 $125 = C^3$   
 $\sqrt[3]{125} = C$   
 $5 = C$

b)  $4, \underline{36}, 324, \underline{2916}, 26244$

$$324 = 4 \cdot C^2$$

$$81 = C^2$$

$$9 = C$$

c)  $3.5, \underline{14}, 56, \underline{224}, 896$

$$56 = 3.5 \cdot C^2$$

$$16 = C^2$$

$$4 = C$$

#3 a)  $\left(\frac{3^2 \cdot 9}{243}\right)^{-3} = \left(\frac{3^2 \cdot 3^2}{3^5}\right)^{-3} = \frac{3^{-6} \cdot 3^{-6}}{3^{-15}} = \frac{3^{-12}}{3^{-15}} = 3^{-12-(-15)} = 3^3$

b)  $\frac{49^2 \cdot 343^{-2}}{\sqrt{2401^{-1}}} = \frac{(7^2)^2 \cdot (7^3)^{-2}}{(2401^{1/2})^{-1}} = \frac{7^4 \cdot 7^{-6}}{(7^4)^{1/2}^{-1}} = \frac{7^{-2}}{7^{-2}} = 7^0 = 1$

c)  $\sqrt{\frac{2^{-2}}{16^{-1}}} = \left(\frac{2^{-2}}{(2^4)^{-1}}\right)^{1/2} = \left(\frac{2^{-2}}{2^{-4}}\right)^{1/2} = \frac{2^{-1}}{2^{-2}} = 2^{-1-(-2)} = 2^1 = 2$

#4 a) oui b) Non c) Non d) oui e) Non

#5 a)  $3^4 = 81 \Rightarrow 4 = \log_3 81$

b)  $144^{1/2} = 12 \Rightarrow \frac{1}{2} = \log_{144} 12$

c)  $\left(\frac{1}{3}\right)^{-2} = 9 \Rightarrow -2 = \log_{\frac{1}{3}} 9$

#6 a)  $\log_2 16 = 4 \Rightarrow 2^4 = 16$

b)  $\log_5 1 = 0 \Rightarrow 5^0 = 1$

c)  $\log 1000 = 3 \Rightarrow 10^3 = 1000$

#7 a)  $\log_5 25 = ? \Rightarrow 5^? = 25 \quad \underline{? = 2}$

b)  $\log_3 \frac{1}{81} = ? \Rightarrow 3^? = \frac{1}{81} \quad \underline{? = -4}$

c)  $\log_{\frac{1}{2}} 8 = ? \Rightarrow \left(\frac{1}{2}\right)^? = 8 \quad \underline{? = -3}$

#8 a)  $y = -2\left(\frac{1}{3}\right)^{-3x+12} - 5$

$y = -2\left(\frac{1}{3}\right)^{-3(x-4)} - 5$

$y = -2 \cdot 27^{x-4} - 5$

b)  $y = 7\left(\frac{1}{2}\right)^{2x+6} + 1$

$y = 7\left(\frac{1}{2}\right)^{2(x+3)} + 1$

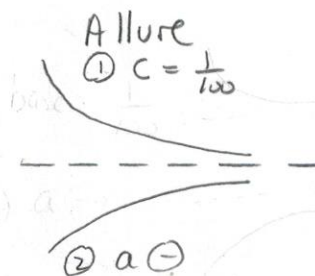
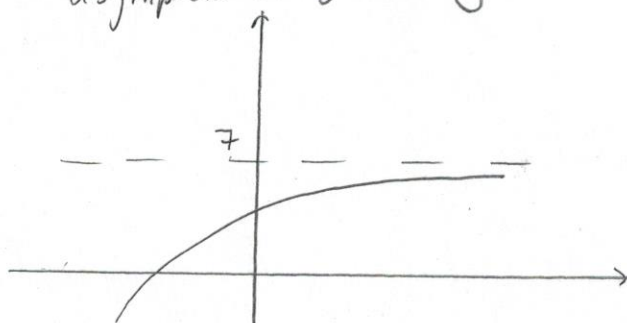
$y = 7\left(\frac{1}{4}\right)^{x+3} + 1$

#9 a)  $y = -3 \cdot 10^{-2x+10} + 7$

b)  $y = -3 \cdot 10^{-2(x-5)} + 7$

$y = -3 \cdot \left(\frac{1}{100}\right)^{x-5} + 7$

asymptote horizontale  $y = 7$



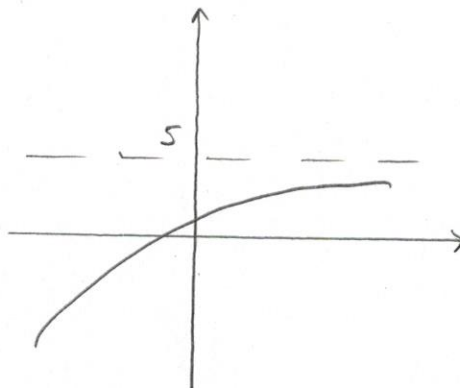
#10 a)  $f_1(x) = -\left(\frac{1}{2}\right)^x + 5$

Allure

①  $c = \frac{1}{2}$



②  $a \ominus$



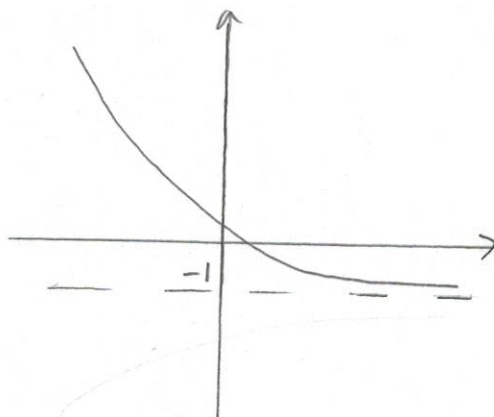
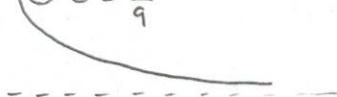
b)  $f_2(x) = -5 \cdot 3^{-2x-8} - 1$

$f_2(x) = -5 \cdot 3^{-2(x+4)} - 1$

$f_2(x) = -5 \cdot \left(\frac{1}{9}\right)^{x+4} - 1$

Allure

①  $c = \frac{1}{9}$



c)  $f_3(x) = -2 \left(\frac{1}{4}\right)^{-1x}$

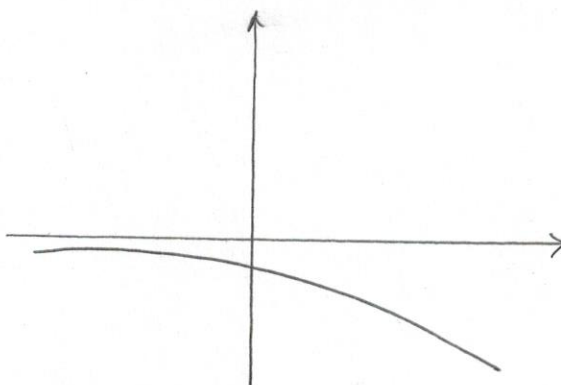
$f_3(x) = -2 \cdot 4^x$

Allure

①  $c = 4$

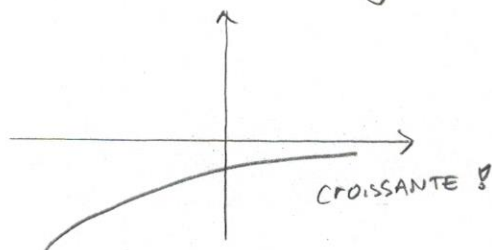


②  $a \ominus$



#11 a) VRAI car  $y=k$  est l'équation de son asymptote

b) FAUX voici un contre-exemple  $y = -2 \cdot \left(\frac{1}{3}\right)^x$



: Allure  
 ①  $c = \frac{1}{3}$  décroissante  
 ②  $a < 0$  croissante

c) FAUX une ft. exponentielle n'a pas d'extrémums, car ces derniers sont non-atteints

d) VRAI  $y=k$  horizontale  $\Rightarrow$  dans la réciproque  $x=h$  verticale

#12 a)  $0 = 3 \cdot 2^{3x-3} - 96$

$$\frac{96}{3} = \frac{3 \cdot 2^{3x-3}}{3}$$

$$32 = 2^{3x-3}$$

$$2^5 = 2^{3x-3}$$

$$5 = 3x-3$$

$$8 = 3x$$

$$\underline{\underline{\frac{8}{3} = x}}$$

b)  $0 = 4 \cdot 3^{x+5} - 4$

$$\frac{4}{4} = \frac{4 \cdot 3^{x+5}}{4}$$

$$1 = 3^{x+5}$$

$$3^0 = 3^{x+5}$$

$$0 = x+5$$

$$\underline{\underline{-5 = x}}$$

#13 a)  $\frac{375}{3} = 3 \cdot \left(\frac{1}{25}\right)^{2x+1}$

$$125 = \left(\frac{1}{25}\right)^{2x+1}$$

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

$$5^3 = 5^{-4x-2}$$

$$3 = -4x-2$$

$$5 = -4x$$

$$\underline{\underline{-\frac{5}{4} = x}}$$

b)  $-3e^{2x-1} + 3 = 0$

$$\frac{-3e^{2x-1}}{-3} = \frac{-3}{-3}$$

$$e^{2x-1} = 1$$

$$e^{2x-1} = e^0$$

$$2x-1 = 0$$

$$2x = 1$$

$$\underline{\underline{x = \frac{1}{2}}}$$

c)  $3^{2x+1} \cdot 9^{x+2} = \frac{1}{81}$

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

$$3^{2x+1} \cdot 3^{2x+4} = 3^{-4}$$

$$3^{4x+5} = 3^{-4}$$

$$4x+5 = -4$$

$$4x = -9$$

$$\underline{\underline{x = -\frac{9}{4}}}$$

$$\#13 d) \frac{8^{2x}}{4^{2x-1}} = 16^x$$

$$\frac{(2^3)^{2x}}{(2^2)^{2x-1}} = (2^4)^x$$

$$\frac{2^{6x}}{2^{4x-2}} = 2^{4x}$$

$$2^{6x-(4x-2)} = 2^{4x}$$

$$2^{2x+2} = 2^{4x}$$

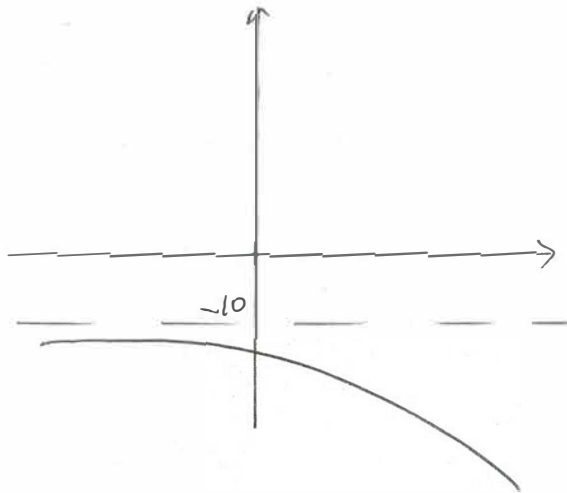
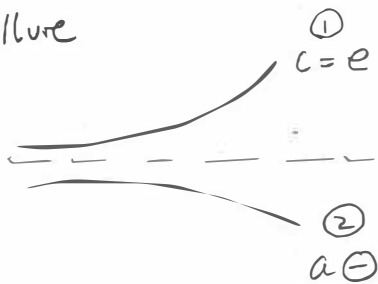
$$2x+2 = 4x$$

$$2 = 2x$$

$$\underline{1 = x}$$

$$\#14 \quad f(x) = -2e^{x+7} - 10$$

Allure



$$\#15 \quad e^{2x-3} = \left(\frac{1}{e}\right)^{-19}$$

$$e^{2x-3} = e^{19}$$

$$2x-3 = 19$$

$$2x = 22$$

$$\underline{x = 11}$$

#16  $V_f = V_i (BASE)^{période}$

$$\frac{20000}{500} = \frac{500 \cdot 3^x}{500} \quad x: \text{nb d'heures}$$

$$40 = 3^x$$

$$x = \log_3 40 = \underline{3,36 h}$$

#17 a)  $0 = 2 \cdot 0,8706^x - 1$

$$\frac{1}{2} = \frac{2 \cdot 0,8706^x}{2}$$

$$0,5 = 0,8706^x$$

$$x = \log_{0,8706} 0,5 = \underline{5 \text{ ans}}$$

b)  $0 = 2 \cdot 0,9985^x - 1$

$$\frac{1}{2} = 0,9985^x$$

$$x = \log_{0,9985} 0,5 = \underline{461,75 \text{ ANS}}$$

c)  $0 = 2 \cdot 0,9999^x - 1$

$$\frac{1}{2} = 0,9999^x$$

$$x = \log_{0,9999} 0,5$$

$$x = \underline{6931,13 \text{ ANS}}$$

#18  $V_f = V_i \cdot BASE^{période}$

Plutonium:  $\frac{51,25}{410} = \frac{410 (\frac{1}{2})^x}{410}$  où  $x = \text{nb de } 24000 \text{ ANS}$

$$0,125 = 0,5^x$$

$$x = \log_{0,5} 0,125$$

$$x = 3 \text{ "24000" ans}$$

$$x = \underline{72000 \text{ ans}}$$

Uranium:  $51,25 = 410 (\frac{1}{2})^x$  où  $x = \text{nb de } 7,1 \times 10^8 \text{ ans.}$

$$0,125 = 0,5^x$$

$$x = \log_{0,5} 0,125$$

$$x = 3 \text{ "7,1} \times 10^8 \text{ ans"}$$

$$x = \underline{21,3 \times 10^8 \text{ ans}} \text{ ou } \underline{2130 \text{ 000 000 ans}}$$

#19  $V_f = V_i (Base)^{période}$

$V_i = 3000\$$

Base = ?  $4\% \rightarrow 12 \text{ mois}$   
 $x \rightarrow 4 \text{ mois}$

$x = 1,3\%$  } Base =  $1 + 0,013 = 1,013$

$V_f = 20000$

$\frac{20000}{3000} = \frac{3000 \cdot (1,013)^x}{3000}$  ou  $x = \text{nb de 4 mois}$

$6,6 = 1,013^x$

$x = \log_{1,013} 6,6 = 143,23 \text{ "4 mois"}$  donc  $\frac{143,23}{3} \text{ ans} = \underline{\underline{47,74 \text{ ans}}}$

#20  $V_i = 2000$

Base =  $0,9 = (1 - 0,1)$

$V_f = 1$

$\left\{ \begin{array}{l} \frac{1}{2000} = \frac{2000 (0,9)^x}{2000} \text{ ou } x = \text{nb de 7 jours} \\ 0,0005 = 0,9^x \end{array} \right.$

$x = \log_{0,9} 0,0005 = 72 \text{ "7 jours"}$  donc environ 505 jours

#21  $V_f = 78000\$$

$V_i = 1800\$$

Base = ?  $2,4\% \rightarrow 12 \text{ mois}$   
 $x \rightarrow 6 \text{ mois}$

$x = 1,27$  } Base =  $1,012$

$\left\{ \begin{array}{l} \frac{78000}{1800} = \frac{1800 (1,012)^x}{1800} \text{ } x = \text{nb de 6 mois} \\ 43,3 = 1,012^x \end{array} \right.$

$x = \log_{1,012} 43,3 = 315,96 \text{ "6 mois"}$

rep:  $\frac{315,96}{2} \text{ ans}$  ou 157,98 ans

#22

a)  $0 = -2\left(\frac{1}{2}\right)^{-x+1} + 14$

$\frac{-14}{-2} = \frac{-2\left(\frac{1}{2}\right)^{-x+1}}{-2}$

$7 = \left(\frac{1}{2}\right)^{-x+1}$

$-x+1 = \log_{\frac{1}{2}} 7$

$-x+1 = -2,81$   
 $\boxed{x = 3,81}$

b)  $0 = 5 \cdot 3^{2x-6} - 20$

$\frac{20}{5} = \frac{5 \cdot 3^{2x-6}}{5}$

$4 = 3^{2x-6}$

$2x-6 = \log_3 4$

$2x-6 = 1,26$

$2x = 7,26$

$\boxed{x = 3,63}$

c)  $0 = 3 \cdot e^{5x-2} - 19$

$\frac{19}{3} = \frac{3 \cdot e^{5x-2}}{3}$

$\frac{19}{3} = e^{5x-2}$

$5x-2 = \ln\left(\frac{19}{3}\right)$  car  $\ln = \log_e$

$5x-2 = 1,85$

$5x = 3,85$

$\boxed{x = 0,77}$

#23a)  $\log = \ominus$  oui vrai car EXPOSANT peut être  $\ominus$

b)  $\log \ominus = ?$  FAUX car  $\log \ominus = ?$  veut dire  $10^? = \ominus$  si la base est  $\oplus$   
alors la puissance le sera!!!  
donc  $10^? \neq \ominus$

#24 a)  $\log_2 5 + \log_2 8 = \log_2 (5 \cdot 8) = \underline{\underline{\log_2 40}}$  (log d'un produit)

b)  $\log_4 45 - \log_4 3 = \log_4 \left(\frac{45}{3}\right) = \underline{\underline{\log_4 15}}$  (log d'un quotient)

c)  $\ln 7 + \ln 8 - \ln 4 = \ln \left(\frac{7 \cdot 8}{4}\right) = \underline{\underline{\ln 14}}$  (log produit et log quotient)

d)  $2 \log 25 - 3 \log 5$   
 $= \log 25^2 - \log 5^3$  log d'une puissance  
 $= \log 625 - \log 125$   
 $= \log \left(\frac{625}{125}\right)$  log d'un quotient  
 $= \underline{\underline{\log 5}}$

e)  $\log_2 0.5 + \log_2 4 + 3 \log_2 3$   
 $\log_2 (0.5 \cdot 4) + \log_2 3^3$  log produit + log puissance  
 $\log_2 2 + \log_2 27 = \log_2 2 \cdot 27$  log produit  
 $= \underline{\underline{\log_2 54}}$

f)  $\frac{\log_2 9}{\log_2 10} - \log 3 = \frac{\frac{\log 9}{\log 2}}{\frac{\log 10}{\log 2}} - \log 3$  Loi du changement de base  
 $= \frac{\log 9}{\log 2} \cdot \frac{\log 2}{\log 10} - \log 3$   
 $= \frac{\log 9}{\log 10} - \log 3$   
 $= \log 9 - \log 3$  car  $\log 10 = 1$   
 $= \log \left(\frac{9}{3}\right)$  log du quotient  
 $= \underline{\underline{\log 3}}$

$$\begin{aligned}
 25 \text{ a) } & \log(x+2) + \log 4 - 2 \log x \\
 &= \log(x+2) + \log 4 - \log x^2 : \log \text{ d'une puissance} \\
 &= \log(4x+8) - \log x^2 : \log \text{ produit} \\
 &= \log\left(\frac{4x+8}{x^2}\right) : \log \text{ quotient}
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } & \log_a t - 2 \log_a 3t + 3 \log_a 2t \\
 &= \log_a t - \log_a (3t)^2 + \log_a (2t)^3 : \log \text{ d'une puissance} \\
 &= \log_a t - \log_a 9t^2 + \log_a 8t^3 \\
 &= \log_a\left(\frac{t}{9t^2}\right) + \log_a 8t^3 : \log \text{ quotient} \\
 &= \log_a \frac{8t^4}{9t^2} : \log \text{ produit} \\
 &= \log_a \frac{8t^2}{9}
 \end{aligned}$$

$$\begin{aligned}
 \#26 \text{ a) } & \log_2 4 + \log_2 8 = 5 \\
 & \log_2 32 = 5 \quad \boxed{\text{VRAI}} \text{ car } 2^5 = 32
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } & \log_5 16 - \log_5 2 = \log_5 8 \\
 & \log_5\left(\frac{16}{2}\right) = \log_5 8 \quad \boxed{\text{VRAI}}
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } & \log_3 8 = 3 \log_3 2 \\
 & \log_3 2^3 = 3 \log_3 2 \quad \boxed{\text{VRAI}}
 \end{aligned}$$

$$\text{d) } \log_5\left(\frac{8}{13}\right) = \frac{\log_5 8}{\log_5 13} \quad \boxed{\text{FAUX}} \text{ car } \log_5\left(\frac{8}{13}\right) = \log_5 8 - \log_5 13$$

$$\text{e) } \log(4+11) = \log 4 \cdot \log 11 \quad \boxed{\text{FAUX}} \text{ car } \log(4 \cdot 11) = \log 4 + \log 11$$

$$\text{f) } \frac{\log_c 7}{\log_c 12} = \log_7 12 \quad \boxed{\text{FAUX}} \text{ car } \frac{\log_c 7}{\log_c 12} = \frac{\log 7}{\log c} \cdot \frac{\log c}{\log 12} = \frac{\log 7}{\log 12} = \log_{12} 7 \quad !$$

#26 g)  $\log_c \left(\frac{3}{2}\right) = \frac{1}{2} \log_c 3$  FAUX car  $\frac{1}{2} \log_c 3 = \log_c 3^{1/2} = \log_c \sqrt{3}$

h)  $\log 6 - 4 \log 2 = \log \left(\frac{6}{2^4}\right)$

$\log 6 - \log 2^4 = \log 3$

$\log \left(\frac{6}{16}\right) = \log 3$  FAUX

i)  $\log (2.5^3)^2 = 6 \log 2.5$

$\log 2.5^6 = \log 2.5^6$  VRAI

#27  $0 = -3 \log_{\frac{1}{2}} (0.5x + 0.5) - 6$

$0.5x + 0.5 > 0$

$\frac{6}{-3} = \frac{-3 \log_{\frac{1}{2}} (0.5x + 0.5)}{-3}$

$0.5x > -0.5$

$x > -1$

Exp  $\left\{ \begin{array}{l} -2 = \log_{\frac{1}{2}} (0.5x + 0.5) \end{array} \right.$

$\left(\frac{1}{2}\right)^{-2} = 0.5x + 0.5$

$4 = 0.5x + 0.5$

$3.5 = 0.5x$

$7 = x$

#28  $f(x) = -4 \log_{\frac{1}{3}} (-2x + 4) - 12$

$0 = -4 \log_{\frac{1}{3}} (-2x + 4) - 12$

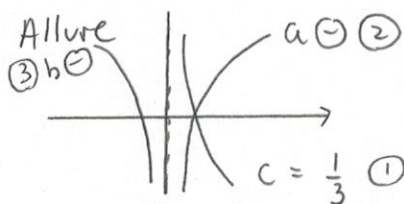
$-2x + 4 > 0$

$-2x > -4$

$x < 2$

$f(x) = -4 \log_{\frac{1}{3}} -2(x - 2) - 12$

$\frac{12}{-4} = \frac{-4 \log_{\frac{1}{3}} (-2x + 4)}{-4}$



Exp  $\left\{ \begin{array}{l} -3 = \log_{\frac{1}{3}} (-2x + 4) \end{array} \right.$

$\left(\frac{1}{3}\right)^{-3} = -2x + 4$

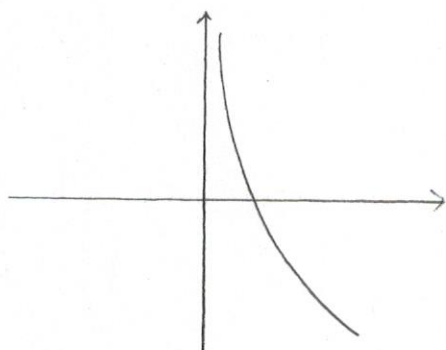
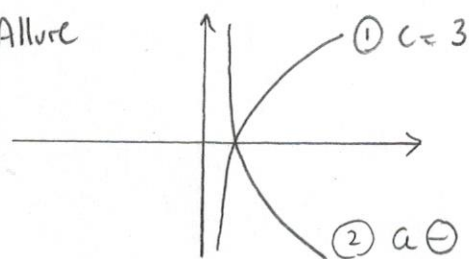
$27 = -2x + 4$

$23 = -2x$

$-11.5 = x$

#28 b)  $g(x) = -2 \log_3(4x) + 6$

Allure



$$0 = -2 \log_3(4x) + 6$$

$$4x > 0$$

$$-6 = -2 \log_3(4x)$$

$$\frac{-6}{-2} = \frac{-2}{-2} \log_3(4x)$$

$$\text{Exp.} \left\{ \begin{array}{l} -3 = \log_3(4x) \\ 3^3 = 4x \end{array} \right.$$

$$27 = 4x$$

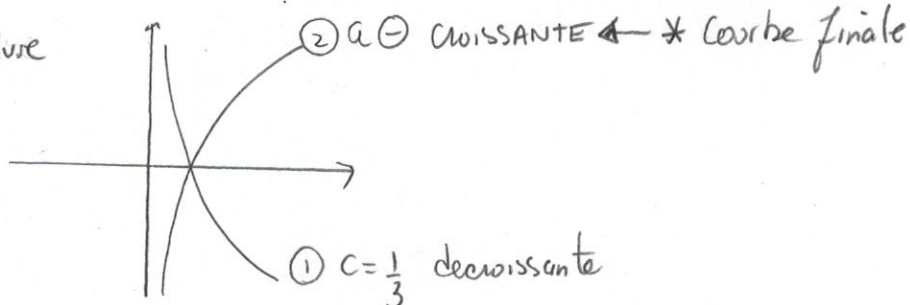
$$\boxed{6.75 = x}$$

#29 a) VRAI car  $x=h$  est l'équation de l'asymptote verticale

b) FAUX voici un contre-exemple

$$y = +2 \log_{\frac{1}{3}} x$$

Allure



c) VRAI la courbe croise toujours l'axe des "x" car l'image est  $\mathbb{R}$ .

d) FAUX si  $h=0$  l'asymptote est l'axe des "y" donc il y aurait aucune ordonnée à l'origine

e) VRAI

#30 a)  $\log_3 x + \log_3 2 = 4$

restriction  $x > 0$

$$\text{Exp.} \left\{ \begin{array}{l} \log_3 2x = 4 \text{ : log produit} \\ 3^4 = 2x \end{array} \right.$$

$$81 = 2x$$

$$\boxed{40.5 = x}$$

#30 b)  $3 \log (0.5x+2)^2 - 1 = 5$   $0.5x+2 > 0$   
 $0.5x > -2$

$6 \log (0.5x+2) - 1 = 5$  : log d'une puissance  $x > -4$

$\frac{6 \log (0.5x+2)}{6} = \frac{6}{6}$

EXP  $\left\{ \begin{array}{l} \log (0.5x+2) = 1 \\ 10^1 = 0.5x+2 \end{array} \right.$

$8 = 0.5x$

$\boxed{16 = x}$

c)  $\log_6 (x+3) + \log_6 (x-2) = 1$

$x+3 > 0$  et  $x-2 > 0$   
 $x > -3$   $x > 2$

EXP  $\left\{ \begin{array}{l} \log_6 (x^2+x-6) = 1 : \text{log produit} \\ 6^1 = x^2+x-6 \end{array} \right.$

$0 = x^2+x-12$

$0 = (x-3)(x+4)$  dnc  $x=3$  et  $x=-4$  No!

d)  $\log_7 (14x) = \log_7 (x-5) + 2$

$14x > 0$   $x-5 > 0$   
 $x > 0$   $x > 5$

$\log_7 (14x) - \log_7 (x-5) = 2$

EXP  $\left\{ \begin{array}{l} \log_7 \left( \frac{14x}{x-5} \right) = 2 : \text{log quotient} \\ 7^2 = \frac{14x}{x-5} \end{array} \right.$

$49 = \frac{14x}{x-5}$

$49(x-5) = 14x$

$49x - 245 = 14x$

$35x = 245$

$\boxed{x = 7}$

$$\#31 \ a) \ y = -2\left(\frac{1}{2}\right)^{x-3} + 7$$

$$x = -2\left(\frac{1}{2}\right)^{y-3} + 7$$

$$\text{EXP} \left[ \begin{array}{l} \frac{x-7}{-2} = \left(\frac{1}{2}\right)^{y-3} \\ \rightarrow y-3 = \log_{\frac{1}{2}} \left(\frac{x-7}{-2}\right) \end{array} \right]$$

$$y = \log_{\frac{1}{2}} \left(\frac{x-7}{-2}\right) + 3$$

$$y = \log_{\frac{1}{2}} (-0,5x + 3,5) + 3$$

$$\#32 \ a) \ 4^{3-2x} = 5^{3x}$$

$$4^{3-2x} = \left(4^{\log_4 5}\right)^{3x}$$

$$4^{3-2x} = \left(4^{1,16}\right)^{3x}$$

$$4^{3-2x} = 4^{3,48x}$$

$$3-2x = 3,48x$$

$$3 = 5,48x$$

$$\boxed{0,55 = x}$$

$$c) \ 2^{x-1} = 5 \cdot 7^{3x}$$

$$2^{x-1} = 2^{\log_2 5} \cdot \left(2^{\log_2 7}\right)^{3x}$$

$$2^{x-1} = 2^{2,32} \cdot \left(2^{2,81}\right)^{3x}$$

$$2^{x-1} = 2^{2,32} \cdot 2^{8,43x}$$

$$2^{x-1} = 2^{8,43x + 2,32}$$

$$x-1 = 8,43x + 2,32$$

$$-3,32 = 7,43x$$

$$\boxed{-0,45 = x}$$

$$b) \ y = 3\ln(x+2) - 5$$

$$x = 3\ln(y+2) - 5$$

$$x+2 > 0$$

$$y+2 > 0$$

$$y > -2$$

$$\text{EXP} \left[ \begin{array}{l} \frac{x+5}{3} = \ln(y+2) \\ \rightarrow e^{\frac{x+5}{3}} = y+2 \end{array} \right]$$

$$\boxed{e^{\frac{1}{3}(x+5)} - 2 = y}$$

$$b) \ \frac{3^{x+1}}{6^{4x+5}} = 2^x$$

$$\frac{3^{x+1}}{\left(3^{\log_3 6}\right)^{4x+5}} = \left(3^{\log_3 2}\right)^x$$

$$\frac{3^{x+1}}{\left(3^{1,63}\right)^{4x+5}} = \left(3^{0,63}\right)^x$$

$$\frac{3^{x+1}}{3^{6,52x+8,15}} = 3^{0,63x}$$

$$3^{-5,52x-7,15} = 3^{0,63x}$$

$$-5,52x - 7,15 = 0,63x$$

$$-7,15 = 6,15x$$

$$\boxed{-1,16 = x}$$

$$\#32 d) 3^{x+5} \cdot 2^{3x-1} = 5^{-2x+6}$$

$$3^{x+5} \cdot (3^{\log_3 2})^{3x-1} = (3^{\log_3 5})^{-2x+6}$$

$$3^{x+5} \cdot (3^{0,63})^{3x-1} = (3^{1,46})^{-2x+6}$$

$$3^{x+5} \cdot 3^{1,89x-0,63} = 3^{-2,92x+8,76}$$

$$3^{2,89x+4,37} = 3^{-2,92x+8,76}$$

$$2,89x+4,37 = -2,92x+8,76$$

$$5,81x = 4,39$$

$$\boxed{x = 0,76}$$

$$e) 2,5 \cdot 10^x = 6 \cdot e^{4x-3}$$

$$e^{\ln 2,5} \cdot (e^{\ln 10})^x = e^{\ln 6} \cdot e^{4x-3}$$

$$e^{0,92} \cdot e^{2,30x} = e^{1,79} \cdot e^{4x-3}$$

$$e^{2,30x+0,92} = e^{4x-1,21}$$

$$2,30x+0,92 = 4x-1,21$$

$$-1,7x = -2,13$$

$$\boxed{x = 1,25}$$

$$\#33 \quad a) \frac{(xy^{-1})^{-2}}{xy^2} = \frac{x^{-2}y^2}{xy^2} = x^{-3}y^0 = x^{-3} = \frac{1}{x^3}$$

$$b) \left( \frac{2x^{-3}y^{-2}}{x^2y^{-1}} \right)^{-1} = \frac{2^{-1}x^3y^2}{x^{-2}y^1} = 2^{-1}x^5y^1 = \frac{x^5y}{2}$$

$$c) \frac{x^{24}}{\sqrt{x^{16}}} = \frac{x^{24}}{x^{16/2}} = \frac{x^{24}}{x^8} = x^{16}$$

$$d) \frac{(4x^6y^{-2})^{1/2}}{x^5} = \frac{4^{1/2} \cdot x^3y^{-1}}{x^5} = 2x^{-2}y^{-1} = \frac{2}{x^2y}$$

$$\#34 \quad 32 = 64^{2-x}$$

$$2^5 = (2^6)^{2-x}$$

$$2^5 = 2^{12-6x}$$

$$5 = 12 - 6x$$

$$-7 = -6x$$

$$\boxed{\frac{7}{6} = x}$$

$$\#35a) 0 = 4 \cdot 3^{x-6} - 324$$

$$81 = 3^{x-6}$$

$$3^4 = 3^{x-6}$$

$$4 = x - 6$$

$$\boxed{10 = x}$$

$$b) 0 = 2 \cdot \left(\frac{1}{7}\right)^{5-x} - 686$$

$$343 = \left(\frac{1}{7}\right)^{5-x}$$

$$7^3 = (7^{-1})^{5-x}$$

$$7^3 = 7^{-5+x}$$

$$3 = -5 + x$$

$$\boxed{8 = x}$$

$$\#36 \quad y = -4\left(\frac{1}{2}\right)^{x-5} + 7$$

$$x = -4\left(\frac{1}{2}\right)^{y-5} + 7$$

$$\frac{x-7}{-4} = \left(\frac{1}{2}\right)^{y-5}$$

$$y-5 = \log_{\frac{1}{2}}\left(\frac{x-7}{-4}\right)$$

$$\boxed{y = \log_{\frac{1}{2}}\left(-\frac{1}{4}(x-7)\right) + 5}$$

$$\#37 \quad \left(\frac{1}{2}\right)^{-3} = 8 \Rightarrow -3 = \log_{\frac{1}{2}} 8$$

$$\#38 \quad \log_{\frac{1}{2}} 4 = -2 \Rightarrow \left(\frac{1}{2}\right)^{-2} = 4$$

$$\#39 \quad \log_2 32 = ? \Rightarrow 2^{\boxed{?}} = 32 \quad \underline{\underline{\boxed{?} = 5}}$$

$$\#40 \quad \log_c 64 = 3 \Rightarrow c^3 = 64$$

$$c = \sqrt[3]{64} = 4$$

$$\#41 \text{ a) } 3\log_2 a + \log_2 a^5$$

$$3\log_2 a^3 + \log_2 a^5 = \log_2 a^3 \cdot a^5 = \log_2 a^8$$

$$\text{b) } 4\log x + \frac{1}{2}\log(x+1) = \log x^4 + \log(x+1)^{1/2} = \log x^4 \cdot (x+1)^{1/2} = \log x^4 \sqrt{x+1}$$

$$\text{c) } 2\log_3 a + \log_3 b - \log_3 c$$

$$\log_3 a^2 + \log_3 b - \log_3 c = \log_3 \left(\frac{a^2 b}{c}\right)$$

$$\#42 \text{ a) } \log_2(7-x)+3 = \log_2(4x+5)$$

$$\log_2(7-x) - \log_2(4x+5) = -3$$

$$\log_2\left(\frac{7-x}{4x+5}\right) = -3$$

$$2^{-3} = \frac{7-x}{4x+5}$$

$$\frac{1}{8} = \frac{7-x}{4x+5} \cdot 4x+5$$

$$\frac{4x+5}{8} = 7-x \cdot 8$$

$$4x+5 = 56-8x$$

$$12x = 51$$

$$x = \frac{51}{12} = \underline{\underline{4,25}}$$

$$\begin{array}{l|l} 7-x > 0 & 4x+5 > 0 \\ -x > -7 & x > -1,25 \\ x < 7 & \end{array}$$

$$\text{b) } \log_{\frac{1}{2}}(x+3) - \log_{\frac{1}{2}}(x+1) = -1$$

$$\log_{\frac{1}{2}}\left(\frac{x+3}{x+1}\right) = -1$$

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

$$2 = \frac{x+3}{x+1} \cdot x+1$$

$$2x+2 = x+3$$

$$2x = x+1$$

$$\underline{\underline{x=1}}$$

$$\begin{array}{l|l} x+3 > 0 & x+1 > 0 \\ x > -3 & x > -1 \end{array}$$