Ets Exp et log

p161 Mise a jour

#1 a) -2^6 b) $2^3 3^3$ c) $-2 \cdot -2^2 \cdot 2^3 \cdot 2^1 \cdot -2^4 = \underline{-2^{11}}$ d) $2 \cdot 2^2 \cdot 2^3 \cdot 2^3 \cdot 2^5 \cdot 2^2 \cdot 3$

$2^{10} \cdot 3^2 \cdot 5$

e) $2 \cdot 3 \cdot 5 \cdot 2^2 \cdot 3 \cdot 2 \cdot -1 = -2^4 \cdot 3^2 \cdot 5$ f) $-2 \cdot 3^2 \cdot 1 \cdot -2 \cdot 2^2 \cdot -3^2$

$-2^4 \cdot 3^4$

#2 a) 27 b) 32 c) 225 d) 1,44 e) 0,027 f) 0 g) 1 h) 1

#3 a) 2^9 b) 9^8 ou 3^{16} c) 3^4 d) 4^2 ou 2^4 e) $\left(\frac{1}{4}\right)^{24}$ ou 2^{-48}

f) $\frac{3^{-35}}{3^{-14}} = 3^{-21}$ g) 6^0 h) $12 \cdot (12^{-3})^3 = 12 \cdot 12^{-9} = 12^{-8}$

#4 a) a^7 b) $a \cdot a^6 = a^7$ c) 2^{3a} d) $a^{-2} = \frac{1}{a^2}$ e) 3^{4+a}

f) a^{2b+1} g) a^3 h) a^0

#5 1 - B 2 - D 3 - A 4 - E 5 - C

#6 a) $x = 3$ b) 6 c) 32 d) 4 e) 4 f) 2041

#7 a) $\sqrt{3}$ b) $\sqrt[3]{5^2}$ c) $\sqrt[5]{4^2} = \sqrt[5]{16}$ d) $\sqrt{7^5}$ e) $\sqrt{3^3}$ f) $\sqrt[4]{36}$ ou $\sqrt{6}$

#8 a) $3^{1/2}$ b) $9^{1/3}$ c) $5^{2/5}$ d) $\left(\frac{2}{3}\right)^{3/2}$ e) $5^{1/2} \cdot 5^{-2/3} = 5^{-1/6}$

f) $\frac{8^{1/4}}{8^{1/2}} = \frac{8^{1/2}}{8^{1/4}} = 8^{1/4}$

#9 a) a b) b^6 c) $8c^{2/3}$ d) $2^{4d} \div 2^{4d} = 1$ e) $\frac{4 \cdot 3 \cdot 3^{1/2} e^{1/2} \cdot 4^{1/2} \cdot e^1}{3^2 \cdot 4^2 e^2}$

$\frac{1}{2 \cdot 3^{1/2} \cdot e}$

#10 a) $7^5 = 7^x$ $x = 5$

b) $13^{-4} = 13^x$ $x = -4$

c) $4^{x+2} = 48$ $x + 2 = 8$ $x = 6$

d) $5^{2x} = 5^{1/2}$ $2x = 1/2$ $\Rightarrow x = 1/4$

e) $\left(\frac{2}{3}\right)^{x+4} = \left(\frac{2}{3}\right)^{-5}$ $x + 4 = -5$ $x = -9$

f) $2^{4x} = 2^{-1}$ $4x = -1$ $x = -1/4$

#11 B - C - F

2

#12 a) i) 16 ii) $4^5 = 1024$

b) $64 = 4^x$ $x = 3$ ii) $2048 = 4^x$ 5 1/2 h.

#13 $3^4 \cdot (3^4)^{-3} = 3^4 \cdot 3^{-12} = 3^{-8} = \frac{1}{3^8}$

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

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

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

e) $\left(\left(\frac{2^4}{2^8}\right)^2\right)^{-2} = -\frac{2^{16}}{3^{32}} = -\frac{1}{2^{16}}$

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

#14 $3^{2a} = 3^8$ $a = 4$

b) $2^{3a} = 2^6$ $a = 2$

c) $5^{a^2} = 5^9$ $a^2 = 9$ $a = \pm 3$

d) $2^{2a} = 2^4$ $a = 2$

e) $3^{2a} = 3^4$ $a = 2$

f) $5^{a^2} = 5^{-4}$ $a = \pm 2$

#15 i) $x^2 + 4\left(\frac{x \cdot 2x}{2}\right) = x^2 + 4x^2 = 5x^2$ NON

ii) $4x^2 + 4\left(\frac{2x \cdot x}{2}\right) = 4x^2 + 4x^2 = 8x^2$

#16 $Vf = 100 \cdot (0{,}985)^x$ x : nb de 50 cm

b) 50 m : 0.5 = 100 $Vf = 100 \cdot 0{,}985^{100} = 22{,}06$?

a) 150 | 95,5671625

200 | 94,13365506

c) i) $Vf = 100 \cdot 0{,}985^{100} = 6{,}587$ ok

ii) $Vf = 100 \cdot 0{,}585^{150} = 5{,}667$ ok

iii) $Vf = 100 \cdot 0{,}985^{200} = 4{,}87$ Nulle

#17 Aucun nb réel multiplié par lui-même ne peut avoir un produit

b) oui $\sqrt[3]{-8} = -2$ car $-2 \cdot -2 \cdot -2 = -8$

#18 a) Krypton 85 $0,5 Y_0 = V_0 (x)^{10,7}$

$0,5 = x^{10,7}$ $x = 0,93727$

$51,25 = 410 (0,93727)^x \Rightarrow x =$

$0,125 = 0,93727^x$

$x = \log_{0,93727} 0,125 = 32,1$ ans

Plutonium 237

$0,5 = x^{24\,000}$ $x = 0,9999\,71119$

$51,25 = 410 (0,9999\,71119)^x$

$x = \log_{0,9999...} 0,125 = 72000$ ans.

Iode 129

$0,5 = x^{1,7 \times 10^7} \Rightarrow x = 0,999999959$

$51,25 = 410 (0,999999959)^x$

$x = \frac{\log 0,125}{\log} = 51000453,71$ ans

Uranium 235 $0,5 = x^{7,1 \times 10^8} \rightarrow x = 0,999\,999\,999$

$51,25 = 410 (\quad)^x$

$x = \log 0,125 / \log \quad = 2,08 \times 10^9$

" 238 $0,5 = x^{4,5 \times 10^9} \Rightarrow x = 0,999\,999\,998$

$51,25 = 410 (\quad)^x$

$x = \log 0,125 / \log \quad = 1,04 \times 10^{10}$

#19

4	16
5	32
6	64

b) 1) $V_f = 1 \cdot 2^{10} = 1024$

2) $2^{24} = 16\,777\,216$

3) $2^{72} = 4,72 \times 10^{21}$

4) $2^{\wedge}$

#20 1 29750

2 25287,50

3 21494,38

4 18270,22

5 15529,69

b) 1) $V_f = V_i \cdot i = 35000 (0,85)^{15} = 3057,60\$$

2) $V_f = 35000 (0,85)^{20} = 1356,58\$$

#21 a) $v_f = 1 \cdot 2^x = 2^8 = 256$ plantes

b) $= 1 \cdot 2^{10} = 1024\ cm^2$

c) $= 2^{13} = 8192\ cm^2$

rep $1000000 - 8192 = 991808\ cm^2$

1000000

$100m^2$ | $10m$ $1000m$

$10m$

$1000m$

#22 a) $10 \cdot 0,8 = 8m$

b) $10 \cdot 0,8^4 = 4,096\ m$

c) $10 \cdot 0,8^n$

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p173 Mise au point 3.1

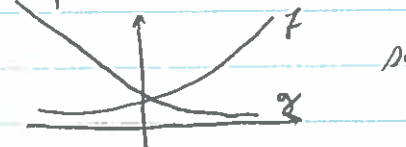
#1 a)

	$\mathbb{R}$	$]0,+\infty[$	3	↘	$y=0$
b)	$\mathbb{R}$	"	1	↗	$y=0$
c)	$\mathbb{R}$	$]1,+\infty[$	1,024	↗	$y=1$
d)	$\mathbb{R}$	$]2,+\infty[$	2,0324	↗	$y=2$
e)	$\mathbb{R}$	$]0,+\infty[$	2,5	↗	$y=0$
f)	$\mathbb{R}$	$]0,+\infty[$	3000	↘	$y=0$

$4 \cdot \left(\frac{10}{3}\right)^{x-4}$ rl

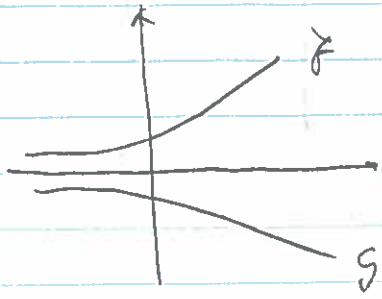
$3000(0,8...)^x$ f)

#2 1)



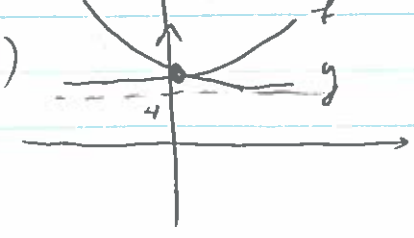
symétrie d'axe "y"

3)



symétrie d'axe "x"

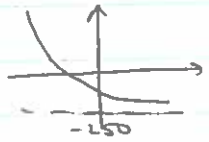
2)



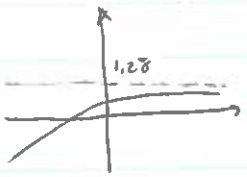
#3 a) ↘ b) ↗ c) ↘

d) $y = 38(5)^{x-3} + 1$ ↗ e) ↗

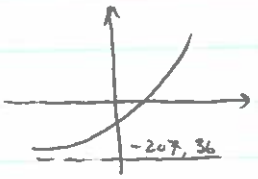
f) $0{,}5(2)^{x-7}$ ↗

#4 a) 

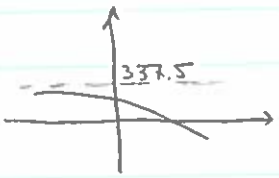
1) $\mathbb{R}$ et $]-250, +\infty[$ 3) ↘
2) $-249{,}99$ 4) $y = -250$

b) 

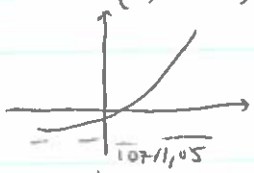
1) $\mathbb{R}$ et $]-\infty, 1{,}28[$ 3) ↗
2) 0 4) $y = 1{,}28$

c) 

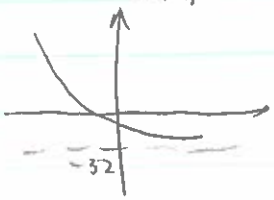
1) $\mathbb{R}$ et $]-207{,}36, +\infty$ 3) ↗
2) $-87{,}36$ 4) $y = -207{,}36$

d) 

1) $\mathbb{R}$ et $]-\infty, 337{,}5[$ 3) ↘
2) 324,33 4) $y = 337{,}5$

e) $y = 10500(1{,}0033)^x - 10711{,}05$ 

1) $\mathbb{R}$ et $]10711{,}05, +\infty$ 3) ↗
2) $-211{,}05$ 4) $y = 10711{,}05$

f) 

1) $\mathbb{R}$ et $]-32, +\infty$ 3) ↘
2) 4064 4) $y = -32$

#5a) $y = ac^x + k$

$4 = ac^0 + 2 \Rightarrow 4 = a + 2 \quad a = 2$

$8 = 2 \cdot c^1 + 2 \Rightarrow 8 = 2c + 2 \quad c = 3$

$\boxed{y = 2 \cdot 3^x + 2}$

5b) $3 = ac^{-1} - 2$ $\quad 3 = 25 \cdot c^{-1} - 2 \Rightarrow 3 = \frac{25}{c} - 2 \Rightarrow 5 = \frac{25}{c}$ $\quad c = 5$

$23 = ac^0 - 2 \Rightarrow 23 = a - 2 \quad a = 25$

$\boxed{y = 25(5)^x - 2}$

c) $-24 = ac^0 + 1$

$-25 = a$

$-4 = -25c^1 + 1$

$\frac{1}{5} = c$

$\boxed{y = -25(\frac{1}{5})^x + 1}$

d) $24 = ac^0 - 8$ | $0 = 32c^2 - 8$

$24 = a - 8$ | $\frac{8}{32} = c^2$

$32 = a$ | $0{,}5 = c$

$\boxed{y = 32(0{,}5)^x - 8}$

e) $0{,}5 = ac^0 - 1$ | $5 = 1{,}5c^2 - 1$

$1{,}5 = a$ | $2 = c$

$\boxed{y = 1{,}5(2)^x - 1}$

f) $-40 = ac^0 - 8$ | $-16 = -32c^2 - 8$

$-32 = a$ | $\frac{1}{2} = c$

$\boxed{y = -32(0{,}5)^x - 8}$

#6 a) 1) $24 = ac$ $\quad 5184 = ac^4$ $\quad \frac{5184}{24} = \frac{ac^4}{ac}$ $\quad 216 = c^3$ $\quad 6 = c$ $\quad 24 = a(6)$ $\quad 4 = a$

$\boxed{y = 4 \cdot 6^x}$

2) $10{,}125 = ac^3$ $\quad 2 = ac^{-1}$ $\quad \frac{10{,}125}{2} = \frac{ac^3}{ac^{-1}}$ $\quad 5{,}0625 = c^4$ $\quad 1{,}5 = c$ $\quad 2 = a(1{,}5)^{-1}$ $\quad 3 = a$

$\boxed{y = 3(1{,}5)^x}$

3) $-81 = ac^4$ $\quad -2187 = ac^7$ $\quad \frac{-2187}{-81} = \frac{ac^7}{ac^4}$ $\quad 27 = c^3$ $\quad 3 = c$ $\quad -81 = a(3)^4$ $\quad -1 = a$

$y = -1(3)^x$

4) $16 = ac^{-3}$ $\quad 0{,}5 = ac^2$ $\quad \frac{16}{0{,}5} = \frac{ac^{-3}}{ac^2}$ $\quad 32 = c^{-5}$ $\quad c = 1/2$ $\quad 0{,}5 = a(0{,}5)^2$ $\quad 2 = a$

$\boxed{y = 2 \cdot 0{,}5^x}$

#66) 1) $13 = ac^1 + 7$ $\quad -7$ $\quad 6 = ac^1$ $\quad \frac{48}{6} = \frac{ac^4}{ac^1}$ $\quad 8 = c^3$ $\quad 13 = a(2) + 7$

$55 = ac^4 + 7$ $\quad -7$ $\quad 48 = ac^4$ $\quad 2 = c$ $\quad 3 = a$

$y = 3 \cdot 2^x + 7$

2) $1235 = ac^3 - 15$ $\quad \underline{1250 = ac^3}$ $\quad 625 = c^4$ $\quad -13 = a5^1 - 15$

$-13 = ac^1 - 15$ $\quad 2 = ac^{-1}$ $\quad 5 = c$ $\quad 10 = a$

$y = 10 \cdot 5^x - 15$

3) $5300000 = ac^7 + 300000$ $\quad \underline{5000000 = ac^7}$ $\quad 10 = c$ $\quad 800000 = a(10)^6 + 300000$

$800000 = ac^6 + 300000$ $\quad 5000000 = ac^6$ $\quad 0,5 = a$

$y = 0,5(10)^x + 300000$

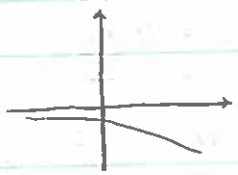
4) $3067 = ac^5 - 5$ $\quad 3067 = 3c^5 - 5$

$-2 = ac^0 - 5 \rightarrow 3 = a$ $\quad 4 = c$

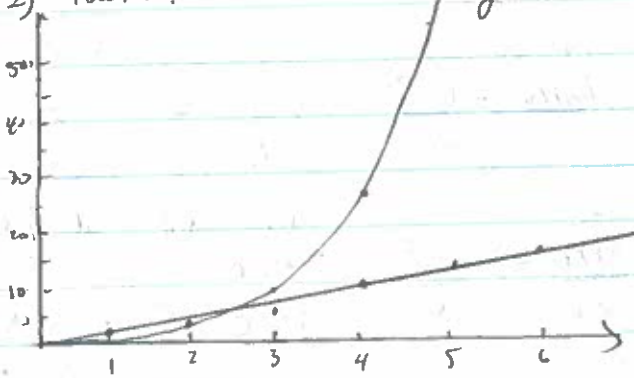
$y = 3 \cdot 4^x - 5$

#7) 1) $2^{3x} \cdot -0,25 \cdot 2^{x+5} = -0,25 \cdot 2^{4x+5}$

2) $f = \frac{2^{3x}}{-0,25 \cdot 2^{x+5}} = -4 \cdot 2^{2x-5}$

b) 1)  dom $\mathbb{R}$ IMA $]-\infty, 0[$

2) idem.

#8 

b) arith : linéaire $\quad$ géom. exp.

c) $y = 3(n-1) + 1$ $\quad$ arith

$y = 3^{x-1}$ $\quad$ géom.

#9 $y = e^x$

b) $y=0$

c) $\mathbb{R}$ et $]0,+\infty[$ 2) ↗ 3) 1

#10 $5400 \cdot (1,036)^{10} = 7691,15\$$

#11 a) $V_f = 25000\,(1,06)^1 = 26500\$$

b) 106%.

c) $V_f = 25000\,(1,03)^2 = 26522,50\$$ 6%. → 12 mois $x = 3$?

d) $\frac{26522,5}{25000} = 106,09$%. $x/2$ → 6 mois

e)

12	1	$25000\,(1,06)^1$	26500
24	2	$25000\,(1,06)^2$	28090
36	3	$25000\,(1,06)^3$	29775,40
48	4	$25000\,(1,06)^4$	31561,92
~~	x	$25000\,(1,06)^x$	
1,5		$25000\,(1,03)^3 = 27318,18$	
2		$25000\,(1,03)^4 = 28137,72$	
2,5		$25000\,(1,03)^5 = 28981,85$	
3		$25000\,(1,03)^6 = 29851,31$	
3,5		$\vdots\ 7 = 30746,85$	
4		$\vdots\ 8 = 31669,25$	
x		$25000\,(1,03)^x$	

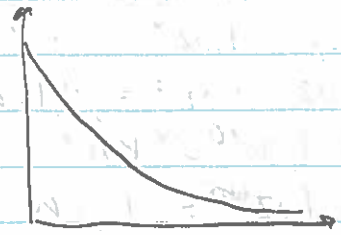
f) Le B car la 2e tranche de 3% est ajouté sur le montant auquel on a déjà ajouté un 3%

#12 a) $x=0$ $T = 13,5$ V

2) $T = 13,5\,e^{-9(15)/100} = 3,5$ V

b) $T = 13,5\,(0,4065)^x$ → ↘

c) $T = 13,5\,e^{-(218/100)} = 4 \times 10^{-8}$

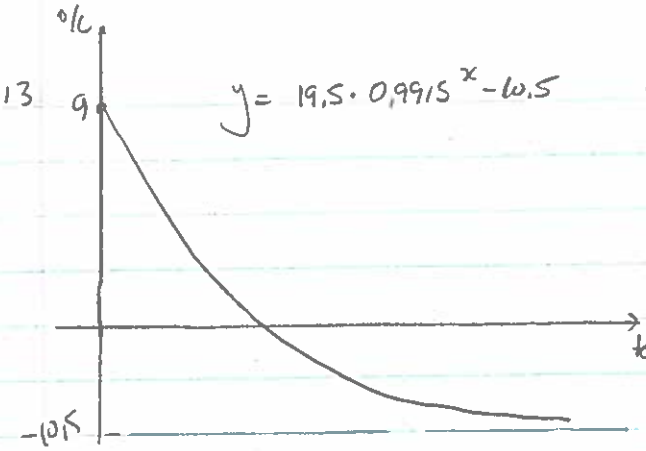


dom $[0, 218]$

Im $[4 \times 10^{-8}, 13,5]$

9

#13



$y = 19,5 \cdot 0,9915^x - 10,5$

b) i) $y = -10,5$

ii) température minimale du congélo jamais atteinte mais

c) Ima $]-10,5, 9[$

d) $x = 0$ $y = 9\,°C$

#14 $V_f = V_i \cdot base^x$

$V_f = 1 \cdot base^x$ $\quad p = 10,086^d$

$1,26 = 1 \cdot base^{0,1}$ $\quad p \approx 10^d$

$base = 10,086$

b) $p = 10^{2,5} = 316,23$ u

c) NON car asymptote $y=0$, l'opacité tendra vers 0 mais sans l'atteindre

#15 $\frac{N}{N_0} = e^{-7x/20}$

$\frac{N}{N_0} = e^{-7/20} \Rightarrow \frac{N}{N_0} = 0.7047$ 70,47 ? $100 - 70,47 = \underline{29,53?}$

b) $\frac{N}{N_0} = e^{-7/20(2)} \Rightarrow \frac{N}{N_0} = 0,4965$ rép: $\underline{30,34?}$

c) $\frac{N}{N_0} = e^{-7/20(5)} \Rightarrow \frac{N}{N_0} = 0,1737$ $\quad \underline{82,62?}$

#16 $V = V_0 (1,005)^{3x}$

#17 $V_f = 2000(0,95)^{10} = 1197,47$ grenouilles

#18 $V_f = 1h \cdot 1,02^x$ $\quad V_f$: intervalle entre 2 caractères en heures

$V_f = 1,02^x$ $\quad x$: nb de jours écoulés

1) $V_f = 1,02^7 = 1,15h$

2) $1,02^{30} = 1,81h$

3) $1,02^{150} = 19,5h$

p185 Mix au point 3.2

#1 a) $4 = \log_3 81$ b) $6 = \log_2 64$ c) $3/2 = \log_5 \sqrt{125}$ d) $1/2 = \log_{144} 12$

e) $-2 = \log_{10} 0{,}01$ f) $3 = \log_{\frac{1}{3}} \frac{1}{27}$ g) $0 = \log_3 1$ h) $-4 = \log_{1/4} 256$

#2 a) $2^5 = 32$ b) $10^3 = 1000$ c) $4^{-1} = 1/4$ d) $10^{-4} = 0{,}0001$

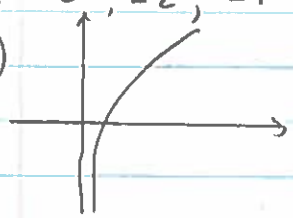
e) $10^1 = 10$ f) $5^0 = 1$ g) $2^{-4} = 1/16$ h) $3^4 = 3^4$

#3 a) 4 b) 3 c) 3 d) 3 e) -2 f) -4 g) -3 h) 1

#4 a) 4 b) 100 c) -2 d) 3/2 e) $x^6 = 1000000$, $x = 10$ f) 9^{-2} g) 3 h) 3,46 ou $\sqrt{12}$, $x^4 = 144$

#5 -3, -2, -1, 0, 1, 2, 3

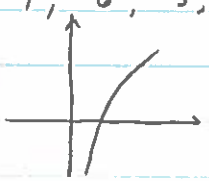
a)



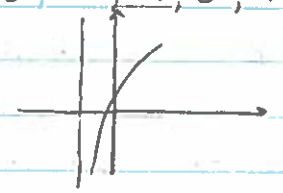
b) -3, -2, -1, 0, 1, 2, 3

idem à c)

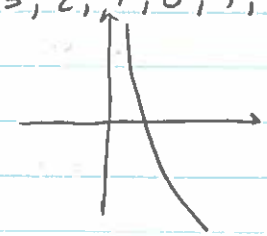
c) -9, -6, -3, 0, 3, 6, 9



d) -3, -2, -1, 0, 1, 2, 3



e) 3, 2, 1, 0, -1, -2, -3



#6 a) 1,49 b) 1,79 c) 0,40 d) 1,91 e) -0,69 f) 0,43 g) 2,31 h) -0,74

#7 a) $x = 3^y$ $y = \log_3 x$

b) $x = 0{,}8^{y+7}$

$x - 7 = 0{,}8^y \Rightarrow y = \log_{0{,}8}(x-7)$

c) $x = 3e^y$

$\frac{x}{3} = e^y \Rightarrow y = \ln = \log_e(x/3)$

d) $x = 4{,}5(10)^{y-2} + 5$

$\frac{x+5}{4{,}5} = 10^{y-2}$ $y - 2 = \log\left(\frac{x+5}{4{,}5}\right)$

$y = \log\left(\frac{x+5}{4{,}5}\right) + 2$

e) $x = 0{,}15\,(1/3)^y$

$\frac{x}{0{,}15} = (1/3)^y$ $y = \log_{1/3}(x/0{,}15)$

f) $x = 5e^{y/2}$

$\frac{x}{5} = e^{y/2} \Rightarrow \frac{y}{2} = \log_e x/5$

$y = 2\ln(x/5)$

#8 a) $x = \log_5 y$ b) $x = 4{,}5 \log(y-3)$ c) $x = 2{,}35 \ln y$

$y = 5^x$ $\frac{x}{4{,}5} = \log(y-3)$ $\frac{x}{2{,}35} = \ln y$

$10^{x/4{,}5} + 3 = y$ $e^{x/2{,}35} = y$

d) $x = 7{,}5 \log_2 2y + 5$ e) $x = 0{,}5 \log(y-4) + 1$ f) $x = 0{,}5 \log_e \frac{y}{2}$

$\frac{x-5}{7{,}5} = \log_2 2y$ $\frac{x-1}{0{,}5} = \log(y-4)$ $2x = \log_e y/2$

$2^{\frac{x-5}{7{,}5}} = 2y$ $10^{\frac{x-1}{0{,}5}} = y-4$ $e^{2x} = y/2$

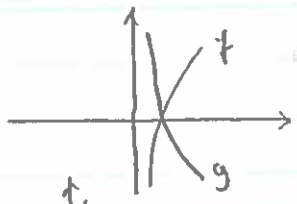
$\frac{2^{\left(\frac{x-5}{7{,}5}\right)}}{2} = y$ $10^{2x-2} + 4 = y$ $2e^{2x} = y$

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

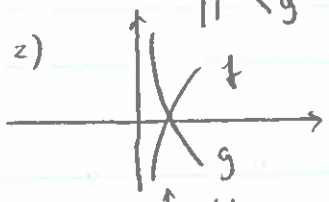
#9

a) $b \& x = 2$	$x = 0$		$]0, +\infty[$	$\mathbb{R}$
b) Base $= 10$	$x = 0$		"	"
c) 1,5	$x = 4$		$]4, +\infty[$	$\mathbb{R}$
d) 0,5	$x = 0$		$]0, +\infty[$	$\mathbb{R}$
e) e	$x = 0$		"	"
f) 3	$x = -1$		$]-1, +\infty[$	"

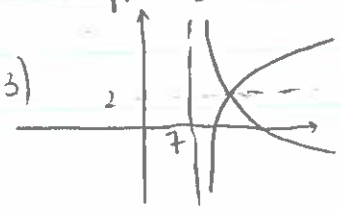
#10 a) 1)



2)



3)



b) symétrie d'axe "x" pour 1 et 2

" " $y = 2$ " 3

#11 a) ↗ b) ↘ c) ↗ d) ↗ e) ↘ f) ↗

#12 $y = \log_c b(x-h)$ pas de a et h

$0 = \log_c b(5-3)$ $\quad c^0 = 2b \quad b = 1/2$

$3 = \log_c b(19-3)$

$3 = \log_c \frac{1}{2}(16)$

$3 = \log_c 8 \quad c^3 = 8 \quad c = 2$

$\boxed{y = \log_2 \frac{1}{2}(x-3)}$

b) $0 = \log_c b(-1+2)$ | $-2 = \log_c 1(2+2)$

$c^0 = b$ | $c^{-2} = 4$

$1 = b$ | $c = 1/2$

$y = \log_{1/2}(x+2)$

c) $0 = \log_c b(4-5)$ | $2 = \log_c -1(2,75-5)$

$c^0 = -b$ | $c^2 = +2,25$

$b = -1$ | $c = 1,5$

$y = \log_{1,5} -(x-5)$

d) $0 = \log_c b(-6+7)$ | $1 = \log_c -\frac{1}{3}(-8+7)$

$c^0 = -3b$ | $c = 7$

$b = -1/3$

$y = \log_7 -\frac{1}{3}(x+7)$

e) $0 = \log_c b(9,5-8)$ | $1 = \log_c \frac{2}{3}(20-8)$

$c^0 = b(1,5)$ | $c^1 = 8$

$b = 2/3$

$y = \log_8 \frac{2}{3}(x-8)$

f) $0 = \log_c b(-3+10)$ | $-4 = \log_c 1/7(102+10)$

$c^0 = 7b$ | $c^{-4} = 16$

$b = \frac{1}{7}$ | $\frac{1}{2} = c$

$y = \log_{\frac{1}{2}} \frac{1}{7}(x+10)$

#13 $y = ac^x + k$

$2,5 = ac^0 + 4$

$-1,5 = a$

$y = -1,5 \cdot c^x + 4$

$-2 = -1,5c^2 + 4$

$y = -1,5 \cdot 2^x + 4$

$\frac{x-4}{-1,5} = 2^y$

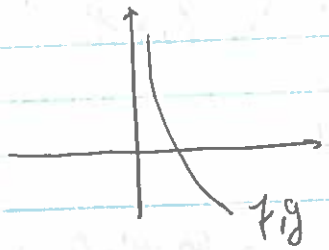
$y = \log_2^{-2/3}(x-4)$

dom $\mathbb{R}$ Ima $]-\infty, +4[$

dom $]-\infty, 4[$

Ima $\mathbb{R}$

#14

a) 

$\hat{\mu}$ courbe

Fig

b) $y = -\log_2 x$

$-y = \log_2 x$

$2^{-y} = x$

$\left(\frac{1}{2}\right)^y = x \rightarrow y = \log_{\frac{1}{2}} x$ □

#15 $x = 0$ v.i $\emptyset$

b) $y = 1{,}5 \log_2 -(x-4)$ v.i = 3 $x = 4$

c) v.i $\emptyset$ $x = 0$

d) $\emptyset$ et $x = 5$

e) $\emptyset$ et $x = 0$

f) $y = \ln^-(x-e)$ v.i = 1 et $x = e$

#16

Tonnerre	115 db	et Dangereuse
Sirène	125 db	et Insupportable
Conversation	60 db	et Normale
Autoroute	95 db	et douloureuse
Discothèque	108 db	et Dangereuse
Rock	130 db	et Insupportable

#17 a) i) $x = 0$ $V = 5000$ volts

ii) $V = 5000 e^{-8,3(5)} = 4{,}74 \times 10^{-15}$ V

b) i) $x = 5000 e^{-8,3y}$

$\frac{1}{5000} x = e^{-8,3y}$ $\quad -8{,}3y = \ln x/5000$

$y = \frac{-1}{8.3} \ln x/5000$

ii) $x = 2500$

$y = ?$ $\quad 8{,}35 \times 10^{-2}$ ms

#18 a) $H^+ = 10^{-pH}$

b) Lait. $1,73 \times 10^{-7}$ mol/L

Jus $3,71$

Eau savon $12,75$

café $1,29 \times 10^{-5}$ mol/L

Soda $7,54$

Ac. gast. $1,21$

Eau 1×10^{-7} mol/L

thé $3,16 \times 10^{-6}$ mol/L

#19 $E = 27,38$ MJ

b) 1) $\frac{E+10}{10} = e^{V/4095}$ $\frac{V}{4095} = \ln \frac{1}{10}(E+10)$

2) $V = 7337,26$ t/min $V = 4095 \ln \frac{1}{10}(E \times 10)$

#20 $\frac{Q}{100} = \left(\frac{1}{10}\right)^{t/2}$ $\frac{t}{2} = \log_{\frac{1}{10}} Q/100$ $t = 2 \log_{\frac{1}{10}} Q/100$

b) $t = -2 \log Q/100$

c) $Q = 75$ $t = -2 \log 75/100 = 0,25$ h

~~p198 Mix and match 3.3~~

#1 a) $c \log_a 46$ b) $2 \log x$ c) $3 \ln(2+x)$ d) $\frac{1}{2} \ln 3x$ e) $-1 \log_c 3x$

f) $3 \ln 4/x$ g) $d \log_a y$ h) $-2 \ln x$

#2 a) $\log_3 6^4$ b) $2 \log_7 5 = \log_7 5^2$ c) $\ln(3t)^2$ d) $3 \log 5 = \log 5^3$

e) $\log_m x^4 - \log_m x^2 = \log_m x^2$ f) $\log 2 + \log 2 + 2 \log 2 = 4 \log 2 = \log 2^4$

g) $\log_3 81^4 - \log_3 9 = \log_3 3^{14}$ h) $\log_5 10^{11} - \log_5 10^{(10^2)^{1/2}} = \log_5 10^9$

i) $\log_6 y + \log_6 y^2 + \log_6 y = \log_6 y^4$

#3 a) 5,91 b) 2,77 c) 2,32 d) 3,21 e) 0,5 f) -1 g) -6
h) -5,72

#4 a) $\log_c 9 = \log 3^2 = 2\log_c 3 = 2,398$

b) $\log_c 25 = 2\log_c 5 = 3,513$

c) $3\log_c 2 = 2,2695$

d) $\log_c 0,5 = \log_c \frac{1}{2} = \log_c 2^{-1} = -1\log_c 2 = -0,7565$

e) $21\log_c 7 = 44,5977$

f) $\log_c 3^{-2} = -2\log_c 3 = -2,398$

g) $\frac{1}{2}\log_c 7 = 1,06185$

h) $\log_c 5^{-1/2} = -\frac{1}{2}\log_c 5 = -0,87825$

c) $\log_c 3^{1/3} = \frac{1}{3}\log_c 3 = 0,3996$

j) $\log_c 7^{-2} = -2\log_c 7 = -4,2474$

k) $\log_c 2^5 / \log_c 7^2 = 5\log_c 2 \div 2\log_c 7 = 0,890544$

l) $\log_c 5^2 \cdot \log_c 3^4 = 2\log_c 5 \cdot 4\log_c 3 = 16,848348$

#5 b) $10^{46} = x$

c) $\frac{2-x}{4} - \log_{13} 3^{3/8} = -0,38239... \Rightarrow x = 3,53$

d) $e^8 = x+5$

$e^8 - 5 = x \Rightarrow x \approx -5$

e) $2^5 = 8 - x$

$24 = -x$

$-24 = x$

f) $4x = \log_{21} 0,35 = -0,34... \Rightarrow x = -0,08$

g) $3^4 = -x$

$-81 = x$

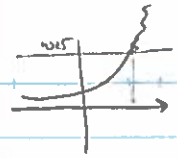
h) $\log 2^{x+2} = \log 5^{3x}$

$(x+2)\log 2 = 3x \log 5$

$x\log 2 + 2\log 2 = 3x\log 5$

$x(\log 2 - 3\log 5) = -2\log 2$

$x = \frac{-2\log 2}{\log 2 - 3\log 5} = 0,3352..$

#6 

$25^x = 1025$

$x = \log_{25} 1025 = 2,15$

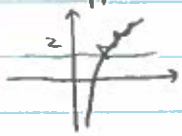
$]2.15, +\infty[$

b) 

$\ln x = 18$

$e^{18} = x$

$[e^{18}, +\infty[$

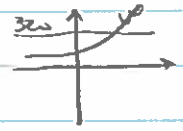
c) 

$\log 3x = 2$

$10^2 = 3x$

$\frac{100}{3} = x$

$]\frac{100}{3}, +\infty[$

d) 

$5(2)^x = 320$

$2^x = 64$

$x = \log_2 64 = 6$

$[6, +\infty[$

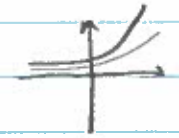
e) $\log -(x-2)$ 

$\log(2-x) = 5$

$10^5 = 2-x$

$-99998 = x$

$]-99998, 2[$

f) 

$10^x = 2^{x-3}$

$\log 10^x = \log 2^{x-3}$

$x \log 10 = (x-3) \log 2$

$x = x \log 2 - 3 \log 2$

$0,6989x = -3 \log 2$

$x = -1,29$

$]-1,29, +\infty[$

g) $y = 3\left(\frac{1}{18}\right)^{x-2}$ 

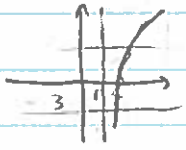
$3(18)^{2-x} = 10^6$

$18^{2-x} = 333333,\overline{3}$

$2-x = \log_{18} L = 4,4$

$x = -2,4$

$]-2,4, +\infty[$

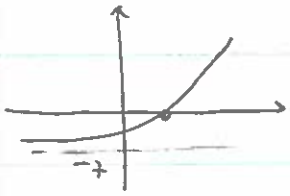
h) 

$\log_2(x-1) = -3$

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

$1,125 = x$

$]1,125, +\infty[$

#7 

$0 = 2 \cdot 3^{x-5} - 7$

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

$x - 5 = \log_3 3,5$

$x = 6,14$

⊕ $]6,14, +\infty$ ⊖ $-\infty, 6,14[$

b) 

$0 = \log(x+2)$

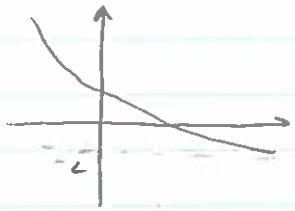
$10^0 = x+2$

$-1 = x$

⊕ $]-1, +\infty$ ⊖ $]-2, -1[$

c) $y = 0.5(3)^{-(x-5)} - 2$

$0,5\left(\frac{1}{3}\right)^{x-5} - 2$



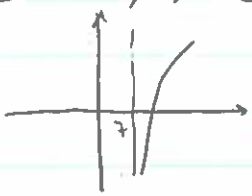
$0 = 0,5(3)^{5-x} - 2$

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

$-x+5 = \log_3 4$

$x = 3,74$

⊕ $-\infty, 3,74[$ ⊖ $]3,74, +\infty$

d) 

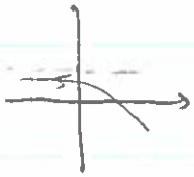
$0 = 2\log_2(x-7) + 9$

$-4,5 = \log_2(x-7)$

$2^{-4,5} = x - 7$

$7,04 = x$

⊕ $]7,04, +\infty$ ⊖ $]7, 7,04[$

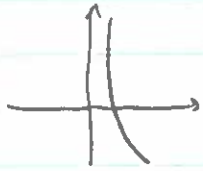
e) 

$0 = -4^x + 5$

$5 = 4^x$

$x = \log_4 5 = 1,16$

⊕ $-\infty, 1,16[$ ⊖ $]1,16, +\infty$

f) 

$0 = -0,5 \ln x - 1$

$-2 = \ln x$

$e^{-2} = x$

$0,14 = x$

⊕ $]0, 0,14[$ ⊖ $]0,14, +\infty$

#8 a) $x^2 = 3$
$x = 1,73$

b) $x^5 = 625$
$x = 3,62$

c) $x^{-1} = 6$
$\frac{1}{6} = x$

d) $(x+4)^4 = 36$
$x+4 = 2,45$
$x = -1,55$

#9 $2\log_2 x - \log_2 x = 3$
$\log_2 x = 3$
$2^3 = x$
$\boxed{x = 8}$

b) $\ln(x-1) = 0$
$e^0 = x-1$
$1 = x-1$
$\boxed{2 = x}$

c) $2\log(x+2) = 1$
$\log(x+2) = 1/2$
$10^{1/2} = x+2$
$\boxed{1,16 = x}$

d) $\ln(x+5) = 0$
$e^0 = x+5$
$\boxed{-4 = x}$

e) $2\log(x-2) - \log(x-2) = 3$
$\log(x-2) = 3$
$10^3 = x-2$
$\boxed{1002 = x}$

f) $2\log_2(x-5) - \log(x-5) = 0$
$\log_2(x-5) = 0$
$2^0 = x-5$
$\boxed{6 = x}$

g) $2\ln x = 2$
$\ln x = 1$
$\boxed{e^1 = x}$ ou $\boxed{-e}$

h) $7\log_2 3x - \log_2 3x = 0$
$6\log_2 3x = 0$
$\log_2 3x = 0$
$2^0 = 3x$
$\boxed{\frac{1}{3} = x}$

i) $2\log(x+5) = 2$
$\log(x+5) = 1$
$10^1 = x+5$
$\boxed{5 = x}$

j) $10^1 = x^2 - 7x + 20$
$0 = x^2 - 7x + 10$
$\frac{7 \pm \sqrt{49 - 40}}{2}$
⊕ $\boxed{5}$
⊖ $\boxed{2}$

#10 a) $15000 = 15000(1,015)^{2t}$
$1 = 1,015^{2t}$
$2t = 0$
$t = 0$ ans

b) $20000 = 15000(1,015)^{2t}$
$1,\overline{3} = 1,015^{2t}$
$2t = \log_{1,015} 1,\overline{3}$
$t = 9,66$ ans

c) $22000 = 15000(1,015)^{2t}$
$1,4\overline{6} = 1,015^{2t}$
$2t = \log_{1,015} 1,4\overline{6}$
$t = 12,86$ ans.

#11 1) $30 = 10\log\left(\frac{t}{12,5}\right)^2$

$3 = \log\left(\frac{t}{12,5}\right)^2 \Rightarrow 10^3 = \left(\frac{t}{12,5}\right)^2 \Rightarrow t = 395,28$

2) $A = 10\log\left(\frac{16}{10}\right)^2 = 4,08$

3) $60 = 10\log\left(\frac{18}{T_0}\right)^2$

$6 = \log\left(\frac{18}{T_0}\right)^2 \quad 10^6 = \left(\frac{18}{T_0}\right)^2 \Rightarrow t_0 = 0,018$

4) $15 = 10\log\left(\frac{T}{15}\right)^2 \quad 1,5 = \log\left(\frac{T}{15}\right)^2 \Rightarrow 10^{1,5} = \left(\frac{T}{15}\right)^2 \Rightarrow T = 84,35$

5) $A = 10\log\left(\frac{36}{18}\right)^2 = 6,02$

6) $45 = 10\log\left(\frac{9}{T_0}\right)^2 \Rightarrow 4,5 = \log\left(\frac{9}{T_0}\right)^2 \quad 10^{4,5} = \left(\frac{9}{T_0}\right)^2 \Rightarrow T_0 = 0,051$

#12 $2500 = 1500\,(1,0175)^x$ 3,5 → 12 mois

$1,\overline{6} = 1,0175^x$ x → 6 mois

$x = \log_{1,0175} 1,\overline{6} = 29,44$ "6 mois" $\Rightarrow \frac{29,44 \times 6}{12} = 14,72$ ans

#13) 1) $M = -2,5 \log 4 = -1,51$

2) $M = -2,5 \log 1000 = -7,5$

3) $M = -2,5 \log 100\,000 = -12,5$

4) $M = -2,5 \log 0,25 = 1,51$

b) 1) $-3,2 = -2,5 \log F$

$1,28 = \log F \Rightarrow 10^{1,28} = F = 19,05$ fois

2) $7,7 = -2,5 \log F$

$-3,08 = \log F \Rightarrow 10^{-3,08} = F = 0,00083$ fois

3) $-10,1 = -2,5 \log F$

$4,04 = \log F \Rightarrow 10^{4,04} = F = 10964,78$ fois

#14 Si $P=0$ $x=?$

Sac plastique : $0 = 2(0,9985)^x - 1$

$0,5 = 0,9985^x$

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

Mouchoir : $0 = 2(0,0625)^x - 1$

$0,5 = 0,0625^x$

$x = \log_{0,0625} 0,5 = \underline{0,25 \text{ ans}}$.

Carton lait $0 = 2(0,9862)^x - 1$

$0,5 = 0,9862^x$

$x = \log_{0,9862} 0,5 = \underline{49,88 \text{ ans}}$

Gomme $0 = 2 \cdot 0,8706^x - 1$

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

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

$x = \log_{0,9999} 0,5 = \underline{6931,13 \text{ ans}}$

#15 $D=2000$ $T=?$

$2000 = 0,1(1,26)^T$

$2000 = 1,26^T$

$T = \log_{1,26} 2000 = 32,85\,^\circ C$

$T = 32,89\,^\circ C$ $D=?$

$32,89 = 2s + 20$

$\underline{6,44} = s$

semaines après le 1er mai

#16 a)

1) $\log_2 A = -0,3 \log_2 1 + 6$

$\log_2 A = 6 \Rightarrow A = 2^6 = \underline{64}$

2) $\log_2 A = -0,3 \log_2 2 + 6$

$\log_2 A = 5,7 \Rightarrow 2^{5,7} = A = \underline{51,98}$

3) $\log_2 A = -0,3 \log_2 6 + 6$

$\log_2 A = 5,22\ldots \quad 2^{5,22\ldots} = A = \underline{37,39}$

4) $\log_2 A = -0,3 \log_2 10 + 6$

$\log_2 A = 5,003\ldots \Rightarrow 2^{5,003\ldots} = A = \underline{32,08}$

b)

1) $\log_2 1 = -0,3 \log_2 B + 6$

$20 = \log_2 B$

$2^{20} = B = \underline{1048576}$.

2) $\log_2 2 = -0,3 \log_2 B + 6$

$16,6 = \log_2 B$

$2^{16,6} = B = \underline{6040X,91}$

3) $\log_2 6 = -0,3 \log_2 B + 6$

$11,38 = \log_2 B$

$2^{11,38} = B = 2671,54$

#1664) $\log_2 10 = -0{,}3\log_2 B + 6$

$8{,}92 = \log_2 B$

$2^{8{,}92\ldots} = B \simeq \underline{486{,}71}$

c) 1) $\log_2 A = -0{,}3\log_2 B + 6$

$2^{-0{,}3\log_2 B + 6} = A$

2) $\log_2 A = -0{,}3\log_2 B + 6$

$\frac{\log_2 A - 6}{-0{,}3} = \log_2 B$

$2^{\frac{\log_2 A - 6}{-0{,}3}} = B$

#17 $500\,000 = 15000(1{,}15)^t$

$33{,}\overline{3} = 1{,}15^t$

$t = \log_{1{,}15} 33{,}\overline{3} = \underline{25{,}09 \text{ ans}}$

#18 1) 0,6989 1,6989 2,6989 3,6989

2) 0,9031 1,9031 2,9031 3,9031

ex $\log 50 = \log 10 \cdot 5$

$= \log 10 + \log 5$

b) 1 de l'unité lorsque l'argument est décuplé □

#19 1) $T = 60(0{,}7)^{1-1} = 60$ min

a) 2) $n = 2$ $T = 42$ min

3) 2,42 min si $n = 10$

b) $45 = 60(0{,}7)^{n-1}$

$0{,}75 = 0{,}7^{n-1}$

$n-1 = \log_{0{,}7} 0{,}75 \Rightarrow n = 1{,}80 \Rightarrow$ au moins $\underline{2 \text{ pièces}}$

2) $30 = 60(0{,}7)^{n-1}$

$0{,}5 = 0{,}7^{n-1}$

$n-1 = \log_{0{,}7} 0{,}5 \Rightarrow n = 2{,}94$ ∴ 3 pièces

3) $15 = 60(0{,}7)^{n-1}$

$0{,}25 = 0{,}7^{n-1}$

$n-1 = \log_{0{,}7} 0{,}25 \Rightarrow n = 4{,}88$ ∴ 5 pièces

#20 $(2,5)$ $y = ac^x + k$

$(0,20)$ $20 = ac^0 - 15$

$k = -15$ $35 = a$

$y = 35c^x - 15$

$5 = 35c^2 - 15$

$0{,}57\ldots = c^2$

$0{,}76 = c$

$y = 35(0{,}755\ldots)^x - 15$

$0 = 35(0{,}755\ldots)^{x-15}$

$0{,}428\ldots = 0{,}755^x$

$x = \log_{0{,}755} 0{,}428\ldots = \boxed{3{,}34}$

#21 a) 1) $7500 = 5000\,e^{r(5)}$

$1,5 = e^{5r}$

$5r = \ln 1,5$

$r = 0,081 \approx 8,11\%$

2) $10000 = 5000(e)^{12r}$

$2 = e^{12r}$

$12r = \ln 2$

$r = 0,0577 \approx 5,78\%$

3) $15000 = 5000(e)^{24r}$

$3 = e^{24r}$

$24r = \ln 3$

$r = 0,04577 \approx 4,58\%$

b) 1) $12000 = 8000\,e^{0,045t}$

$1,25 = e^{0,045t}$

$0,045t = \ln 1,5$

$t = 4,96$ ans

2) $16000 = 8000\,e^{0,045t}$

$0,045t = \ln 2$

$t = 15,40$ ans

3) $24000 = 8000\,e^{0,045t}$

$0,045t = \ln 3$

$t = 24,41$ ans

c) 1) $2P = P\,e^{rt}$

$2 = e^{rt}$

$rt = \ln 2$

$r = \dfrac{\ln 2}{t}$

c) 2) $t = \dfrac{\ln 2}{r}$

#22 $T = 20(2)^0 = \boxed{20\,^\circ C}$ $\quad T = 40(4)^{\frac{2(0)}{5}} = \boxed{40\,^\circ C}$

b) $\dfrac{20(2)^x}{2} = \dfrac{40(4)^{2/5x}}{20}$

$2^x = 2(4)^{\frac{2}{5}x}$

$2^x = 2^1 \cdot (2^2)^{\frac{2}{5}x}$

$2^x = 2^1 \cdot 2^{4/5x}$

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

$x = \frac{4}{5}x + 1$

$\boxed{x = 5\text{ h}}$

c) $\dfrac{20(2)^x}{20} = 2\left(\dfrac{40 \cdot 4^{\frac{2}{5}x}}{20}\right)$

$2^x = 2 \cdot 2 \cdot 4^{2/5x}$

$2^x = 2^2 \cdot 2^{4/5x}$

$2^x = 2^{2+4/5x}$

$x = 2 + \frac{4}{5}x$

$\boxed{x = 10\text{ h}}$

#23 a) i) $75 = 100e^{-x/66}$

$0{,}75 = e^{-x/66}$

$\frac{-x}{66} = \ln 0{,}75$ $\quad x = 18{,}59$ cm

ii) $0{,}5 = e^{-x/66}$

$\frac{-x}{66} = \ln 0{,}5$ $\quad \Rightarrow x = 45{,}75$

b) i) $25 = 100e^{-x/66}$

$\frac{-x}{66} = \ln 0{,}25$

$x = 91{,}50$cm

ii) $83 = 100e^{-x/66}$

$\frac{-x}{66} = \ln 0{,}83$

$x = 12{,}30$cm

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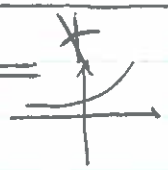
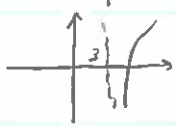
p208 Vue d'ensemble

#1 a) $y = 1{,}8(3)^x$  2) $\mathbb{R}$ et $]0,\infty[$ 3) $y = 1{,}8$ 4) $\emptyset$ 5) $\oplus$ sur $\mathbb{R}$

b) $y = 2\log(x-3)$  2) $]3,\infty[$ et $\mathbb{R}$ 3) $\emptyset$

4) $0 = 2\log(x-3)$

$0 = \log(x-3)$

$10^0 = x-3$

$1 = x-3$

$\boxed{4 = x}$

5) $\oplus$ $]4,\infty[$ $\ominus$ $]3,4[$

c) $y = -0{,}5\ln x$  2) $]0,\infty[$ et $\mathbb{R}$ 3) $\emptyset$

4) $0 = -0{,}5\ln x$

$0 = \ln x$

$e^0 = x$

$\boxed{1 = x}$

5) $\oplus$ $]0,1[$ $\ominus$ $]1,\infty[$

d) $y = -3(1{,}15)^{x-5} - 10$  2) $\mathbb{R}$ et $]-\infty,-10[$ 3) $y = -11{,}49$

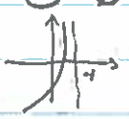
4) $\emptyset$ 5) $\oplus$ $\emptyset$ $\ominus$ $\mathbb{R}$

#1e) $y = 0{,}15(0{,}3)^x + 5$  2) $\mathbb{R}$ et $]5, +\infty[$ 3) 5,15

4) $\emptyset$ 5) $\oplus$ sur $\mathbb{R}$ $\ominus$ $\emptyset$

f) $y = 450\left(\frac{1}{e^{2,3}}\right)^x$  2) $\mathbb{R}$ et $]0, +\infty[$ 3) 450

4) $\emptyset$ 5) $\oplus$ sur $\mathbb{R}$ $\ominus$ $\emptyset$

g) $y = -5\log_2(-(x-4))$  2) $]-\infty, 4[$ et $\mathbb{R}$ 3) -10

4) $0 = -5\log_2(4-x)$ 5) $\oplus$ $]3,4[$ $\ominus$ $]-\infty, 3[$

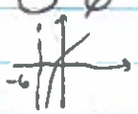
$0 = \log_2(4-x)$

$2^0 = 4-x$

$3 = x$

h) $y = 1800(1{,}015)^{3x}$  2) $\mathbb{R}$ et $]0, +\infty[$ 3) 1800

4) $\emptyset$ 5) $\oplus$ sur $\mathbb{R}$ $\ominus$ $\emptyset$

i) $y = 0{,}6\log_5(x+6) - 8$  2) $]-6, +\infty[$ et $\mathbb{R}$ 3) -7,33

4) $0 = 0{,}6\log_5(x+6) - 8$ 5) $\oplus$ $]2087372976, +\infty[$ $\ominus$ $]-6, 2087372976[$

$13{,}\overline{3} = \log_5(x+6)$

$5^{13,\overline{3}} = x+6$

$2087372976 = x$

#2 a) $y = ac^x + k$ | $1 = 2c^1 - 5$ } $y = 2 \cdot 3^x - 5$

$-3 = ac^0 - 5$ | $3 = c$

$-3 = a - 5$

$2 = a$

b) $y = \log_c b(x-h)$ | $1 = \log_c 2$ } $y = \log_2 x$

$0 = \log_c b(1)$ | $c^1 = 2$

$c^0 = b$

$1 = b$

c) $0 = \log_c b(-1+2)$ | $1 = \log_c(0{,}25+2)$ } $y = \log_{2,25}(x+2)$

$c^0 = b$ | $c^1 = 2{,}25$

$1 = b$

d) $y = ac^x + k$ | $-3 = 4c^2 - 4$ | $y = 4(0,5)^x - 4$

$0 = ac^0 - 4$ | $0,25 = c^2$

$0 = a - 4$ | $0,5 = c$

$4 = a$

e) $1500 = ac^0 + 0$ | $1640 = 1500c^2$ | $y = 1500(1,0456)^x$

$1500 = a$ | $1,0456 = c$

f) $y = \log_c b(x-h)$ | $-2 = \log_c (0+4)$ | $y = \log_{0,5}(x+4)$

$0 = \log_c b(-3+4)$ | $c^{-2} = 4$

$c^0 = b$ | $c = 0,5$

$1 = b$

g) $-2 = ac^0$ | $-8 = -2c^1$ | $y = -2 \cdot 4^x$

$-2 = a$ | $4 = c$

h) $y = \log_c b(x-h)$ | $-3 = \log_c \frac{1}{8}(2-1)$ | $y = \log_2 \frac{1}{8}(x-1)$

$0 = \log_c b(9-1)$ | $c^{-3} = \frac{1}{8}$

$c^0 = 8b$ | $c = 2$

$b = \frac{1}{8}$

i) $y = ac^x + k$ | $1 = -1c^2 + 5$ | $y = -1 \cdot 2^x + 5$

$4 = ac^0 + 5$ | $4 = c^2$

$-1 = a$ | $2 = c$

#3a) $x - 7 = \log_2 100$

$x = 13,64$

b) $2^3 = x - 7$

$15 = x$

c) $\log 5^x = \log 3^{4-x}$

$x \log 5 = (4-x) \log 3$

$x \cdot 0,6989 = (4-x) \cdot 0,4771$

$0,6989x + 0,4771x = 1,908\ldots$

$1,17609x = 1,908$

$x = 1,6227\ldots$

d) $10^6 = 8x$

$125000 = x$

e) $-\ln 3x = 0,5$

$\ln 3x = -0,5$

$e^{-0,5} = 3x$

$x = 0,2022$

f) $2x = \log_7 18$

$x = 0,7427$

g) $3^4 = (2-x)$

$-79 = x$

h) $\log 3^{x/2} = \log 1{,}5^{2-x}$

$0{,}5x \log 3 = (2-x)\log 1{,}5$

$0{,}2388x = 0{,}3522 - 0{,}1761x$

$0{,}4147x = 0{,}3522$

$x = 0{,}8493$

4

a) 

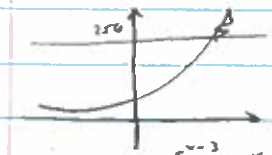
$x+2 > 0 \quad x > -2$

$\log(x+2) = 5$

$10^5 = x+2$

$99998 = x$

$]99998, +\infty[$

b) 

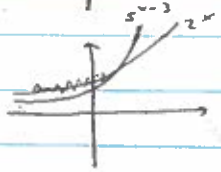
$2^{x+1} = 256$

$2^{x+1} = 2^8$

$x+1 = 8$

$x = 7$

$]7, +\infty[$

c) 

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

$x - 3\log 5 = x\log 2$

$x\log 5 - 3\log 5 = x\log 2$

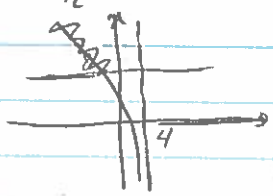
$x\log 5 - x\log 2 = 3\log 5$

$x(\log 5 - \log 2) = 3\log 5$

$x = 5{,}27$

$]-\infty, 5{,}27[$

$y = \log_2(x-4)$

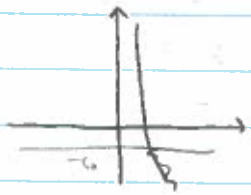
d) 

$\log_2(4-x) = 8$

$2^8 = (4-x)$

$-252 = x$

$]-\infty, 252]$

e) 

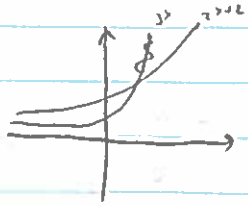
$-0{,}5\ln 2x = -6$

$\ln 2x = 12$

$e^{12} = 2x$

$81377{,}4 = x$

$]81377{,}4, +\infty[$

f) 

$3^x = 2^{x+2}$

$\log 3^x = \log 2^{x+2}$

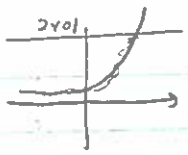
$x\log 3 = (x+2)\log 2$

$x\log 3 = x\log 2 + 2\log 2$

$x(\log 3 - \log 2) = 2\log 2$

$x = 3{,}42$

$[3{,}42, +\infty[$

#4g) 

$7^{x+2} = 2401$

$7^{x+2} = 7^4$

$x+2 = 4$

$x = 2$

$(-\infty, 2]$

h) 

$-3\log x = 21$

$\log x = -\frac{21}{3}$

$10^{-\frac{21}{3}} = x$

$1,1 \times 10^{-7} = x$

$[1,0 \times 10^{-7}, \infty)$

#5a) $x = 3 \cdot 0,7^{y+2}$

$\frac{x-2}{3} = 0,7^y$

$y = \log_{0,7} \frac{x-2}{3}$

b) $x = -2,5\, e^{-2y}$

$\frac{x}{-2,5} = e^{-2y}$

$-2y = \ln \frac{x}{-2,5}$

$y = -\frac{1}{2} \ln\left(\frac{x}{-2,5}\right)$

c) $x = 7\log_2(y+9)$

$\frac{x}{7} = \log_2(y+9)$

$2^{x/7} = y+9$

$y = 2^{x/7} - 9$

d) $x = 1,5\,(0,05)^{4-y}$

$\frac{x}{1,5} = 0,05^{4-y}$

$4-y = \log_{0,05} x/1,5$

$y = -\log_{0,05}(x/1,5) + 4$

e) $x = 455 \ln \frac{y}{321}$

$\frac{x}{455} = \ln \frac{y}{321}$

$e^{x/455} = \frac{y}{321} \Rightarrow y = 321\, e^{x/455}$

f) $x = 3\log y/7$

$\frac{x}{3} = \log y/7$

$10^{x/3} = \frac{y}{7}$

$y = 7 \cdot 10^{x/3}$

#6a) $2^x(16+20-4) = 1024$

$2^x(32) = 1024$

$2^x = 32$

$x = 5$

b) $8(5)^x + 2 \cdot 5^x \cdot 5 + 7(5)^x = 625$

$5^x(8+10+7) = 625$

$5^x(25) = 625$

$5^x = 25$

$x = 2$

6c) $4 \cdot 3^x + 7 \cdot 3^x \cdot 3 - 3^x = 4$

$3^x(4 + 21 - 1) = 4$

$3^x(24) = 4$

$3^x = 0,16$

$x = \log_3 0,16 = \boxed{-1,63}$

d) $2^x + 2^2 \cdot 3 \cdot (2^{x-2}) - 1 = 48$ ($3 \cdot 2^x$)

$2^x(1 + 3) - 1 = 48$

$4 \cdot 2^x - 1 = 48$

$2^x = 12,25$

$x = \log_2 12,25 = \boxed{3,61}$

#7 par année : $V_f = 1600\,(1,04)^{20} = 3565,79\,\$$

au 6 mois $V_f = 1600\,(1,02)^{40} = 3532,86\,\$$ ←

#8 $\frac{5}{5}(1,5)^x = \frac{5}{5}(1,5)^{14-x}$

$1,5^x = 1,5^{14-x}$

$x = 14 - x$

$x = 7$ $\quad P = 5(1,5)^7 = 85,43$ MW

#9 a) $V = 5000\left(1 + \frac{8\%}{2}\right)^{10} = 7401,22\,\$$

b) $V = 5000\,(1,02)^{20} = 7429,74\,\$$

c) $V = 5000\,(1 + 8/52)^{52 \cdot 5} = 7456,83\,\$$

b) ils ↑

#10 $z = \log_2(3 - h)$ } $y = \log_2(x + 1)$

$2^2 = 3 - h \Rightarrow h = 1$

a) $y = \log_2 11 = 3,46$ M

b) $y = \log_2 16 = 4$M

c) $y = \log_2 31 = 4,95$ M

#11 $y = ac^x$ $\quad y =$ épaisseur $\quad x =$ intensité du rayon x

$34 = ac^{600}$

$1 = ac^{75}$

$34 = c^{525}$

$c = 1,00673\ldots$

$1 = a(1,00673)^{75}$

$a = 0,604\ldots$

$y = 0,604 \cdot 1,00673^x$

rép du livre $y = \frac{9189}{10000}\, e^{13x/2000}$

#12 $Vf = 2,5\ (1,05)^x$

$4 = 2,5(1,05)^x$

$1,6 = 1,05^x$

$x = \log_{1,05} 1,6 = \underline{9,63 \text{ ans}}$

#13 $Q = 1000\ (0,9)^x$

b) $Q = 1000\ (0,9)^2 = 810$ rep $1000 - 810 = \underline{290\ L}$

c) 97,5% de 1000 = 975 L évaporé donc reste 25 L

$25 = 1000\ (0,9)^x$

$0,025 = 0,9^x$

$x = \log_{0,9} 0,025 = 35,01 h$

d) 25 L

#14 c) 1) 450 g 2) 10,7 3) 225 g

b) 1) $225 = 450\ e^{10,7a}$

2) $0,5 = e^{10,7a}$

$10,7a = \ln 0,5$

$a = -0,06478011$

3) $M = 450\ e^{-0,06478011t}$

c) 1) $2,5 = 5\ e^{5700a}$

$0,5 = e^{5700a}$ $\quad M = 5e^{-0,00012104t}$

$5700a = \ln 0,5$

$a = -0,00012104$

2) $12,3a = \ln 0,5$ $\quad M = 50\ e^{-0,056t}$

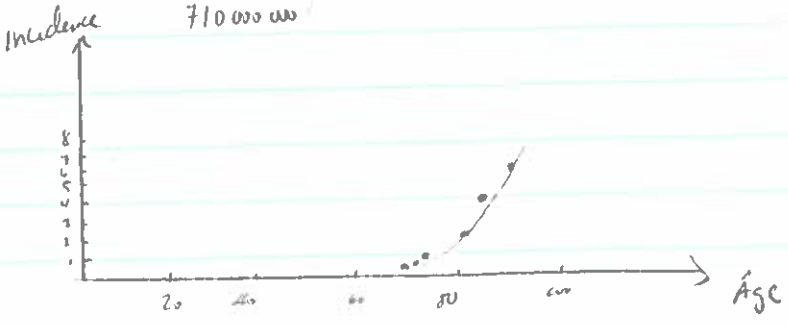
$a = -0,056$

3) $710\,000\,000a = \ln 0,5$ $\quad M = M_0\ e^{kt}$

$a = \underline{\ln 0,5}$

$710\,000\,000$

#15



#15b) $I = ac^x$

$\begin{cases} 2,3 = ac^{82} \\ 4 = ac^{87} \end{cases}$

$1,74 = c^5$

$c = 1,1170341 \Rightarrow 2,3 = a(1,1170341)^{82}$ $\quad I = 0,000263196(1,1170341)^x$

$a = 0,000263196$

rép du livre $I = \frac{e^{0,1275a}}{16666,67}$

c) $I = 1 \quad a = ? \quad 1 = \frac{e^{0,1275a}}{16666,67}$ $\quad 16666,67 = e^{0,1275a}$

$0,1275a = \ln 16666,67$

$a = 76$ ans et ☺

#16 a) $d = \log 5 \cdot 70 = 2,54$ mm

b) $2 = \log 5t$

$10^2 = 5t \Rightarrow t = 20°C$

c) $4 = \log 5t$

$10^4 = 5t \Rightarrow t > 2000°C$

d) $d = \log 5 \cdot 450 = 3,35$ mm

#17 $25000 = 1000\, e^{9t/5} - 1000$

$26 = e^{9t/5}$

$\frac{9t}{5} = \ln 26 \Rightarrow t = 1,81$ min

#18 $C = C_0 e^{-0,1(5)}$

a) $\frac{C}{C_0} = e^{-0,1(5)} = 0,6065 \Rightarrow 60,65\%$

b) $0,05 = e^{-0,1t}$

$-0,1t = \ln 0,05$

$t = 29,96$ jours

#19 ↘ car la base $e^{-1,2}$ est $< a\ 1$

b) 1) $T_1 = T_1 e^{-1,2x}$

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

$-1,2x = \ln 1$

$x = 0h$

2) $0,75T_2 = T_2 e^{-1,2x}$

$0,75 = e^{-1,2x}$

$-1,2x = \ln 0,75$

$x = 0,24\ h$

c) $2T_2 = T_2 e^{-1,2x} \Rightarrow -1,2x = \ln 2 \Rightarrow -0,58$

$T_1 = 2T_1 e^{-1,2x}$

$0,5 = e^{-1,2x}$

$-1,2x = \ln 0,5$

$x = 0,58h$ et ☺

#20 a) $t=0 \Rightarrow \boxed{P=250}$

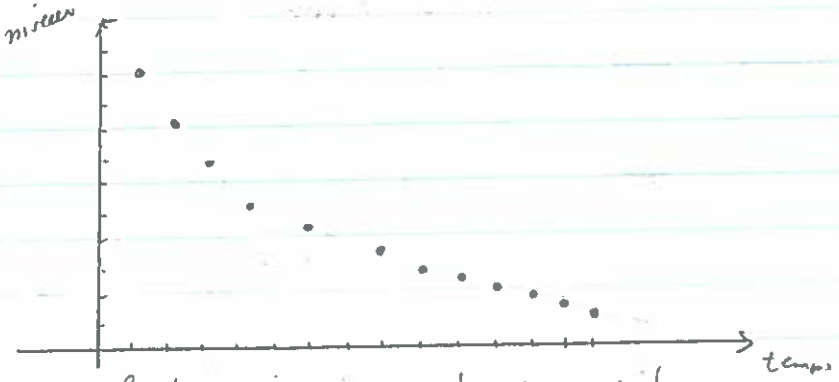
b) 1) $t=1 \Rightarrow P=503$ poissons/k

2) $t=2$ $P=1014$ "

3) $t=4$ $P=4111$ "

c) $t=1/7$ (1 jour) $P=?=276,29$ rép. $276,29-250=26$ poissons/k

#21



b) Comme le liens je vais prendre une règle de type $y=ae^{bx}$

$10=ae^{b}$

$\div \quad 3=ae^{7b}$

$\frac{10}{3}=e^{b-7b}$

$b-7b=\ln 10/3$

$-6b=\ln 10/3$

$b=-0,2007$

$10=ae^{-0,2007}$

$12,22=a$

c) 1) $\boxed{y=12,22e^{-0,2007x}}$

$8=12,22e^{-0,2007x}$

$0,65=e^{-0,2007x}$

$-0,2007x=\ln 0,65$

$x=2,11$ semaines

2) $7=12,22e^{-0,2007x}$

$0,57=e^{-0,2007x}$

$-0,2007x=\ln 0,57$

$x=2,77$ sem

3) $6=12,22e^{-0,2007x}$

$0,49=e^{-0,2007x}$

$-0,2007x=\ln 0,49$

$x=3,54$ sem

4) $4=12,22e^{-0,2007x}$

$-0,2007x=\ln 4/12,22$

$x=5,56$ sem

#22 a) $t = 0 \quad Q = 30\ \%$

b) $28 = 30\, e^{-0,01t}$

$\frac{28}{30} = e^{-0,01t} \Rightarrow -0,01t = \ln 28/30$

$t = 6,90$ ans

#23 a) $h = 1 \quad T = 273 \quad P_0 = 103$

$P_h = 103\, e^{-9,8 \cdot 1/273} = 99,37$ kpa

b) $P = 100 \quad T = 263 \quad P_0 = 103$

$100 = 103\, e^{-9,8h/263}$

$\frac{100}{103} = e^{-9,8h/263} \Rightarrow \frac{-9,8h}{263} = \ln(100/103) \Rightarrow h = 0,793$ km

c) $P = 70 \quad h = 5000 \quad P_0 = 100$

$70 = 100\, e^{-9,8 \cdot 5/t}$

$\frac{70}{100} = e^{-9,8 \cdot 5/t} \Rightarrow \frac{-9,8 \cdot 5}{t} = \ln(70/100) \Rightarrow t = 137,38$ K

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p216 BANQUE DE PROBABILITÉS ✱

#1 $E = 200\,000 \quad 6\%/\text{an} \Rightarrow 0,5\%/\text{mois} = i \quad P = 1100$ ou 1200 avec 500

✱ $200\,000 = 1500 \cdot \frac{1 - \left(\frac{1}{1+0,005}\right)^n}{0,005}$

$133,\overline{3} = \frac{1 - (1/1,005)^n}{0,005}$

$0,\overline{3} = \left(\frac{1}{1,005}\right)^n \Rightarrow n = \log_{1/1,005} 0,\overline{3} = 220,27$ paiements de $1500\$ = 330\,405\$$

✱ $200\,000 = 1200 \cdot \frac{1 - \left(\frac{1}{1,005}\right)^n}{0,005}$

$0,1\overline{6} = \left(\frac{1}{1,005}\right)^n \Rightarrow n = \log_{1/1,005} 0,1\overline{6} = 359,25$ " de $1200\$ \quad 431\,096\$$

$100\,691\$$ d'économies

#2 1) $M = M_0 (1,3)^x$ (x min) 2) $M = M_0 e^{0,3t}$ (x min) 3) $M = M_0 (1,005)^x$ (x sec)

$2M_0 = M_0 (1,3)^x$

$2 = 1,3^x$

$x = \log_{1,3} 2 = 2,64$ min

$2M_0 = M_0 e^{0,3t}$

$2 = e^{0,3t}$

$0,3t = \ln 2$

$t = 2,31$ min

$2M_0 = M_0 (1,005)^x$

$2 = 1,005^x$

$x = \log_{1,005} 2$

$x = 138,98$ sec

$\Rightarrow$ 2,32 min

La situation 1 double en 1er avec un écart de 0,33 min d'avance (19,8 sec)

#3 Les robots se reproduisent de façon exponentielle, car à toutes les 30h les robots doublent

Règle est $N = 1 \cdot 2^{t/30}$ t en heure

Calculons le temps où le Nombre de robots est de 25 000 000 000

$25\,000\,000 = 2^{t/30}$

$\frac{t}{30} = \log_2 2,5 \times 10^{10} \Rightarrow t = 1036,24$ h donc 43,18 jours

Il faut modifier le plan de fonctionnement de telle sorte qu'un robot se désactive de façon définitive immédiatement après avoir construit un autre. De cette manière la pop. de robots demeurera constante

#4 règle $Y = 2^n - 1$ Y = nb min de déplacements n = nb de disques

$255 = 2^n - 1$

$256 = 2^n$

$2^8 = 2^n$

$\boxed{8 = n}$

#5 $P = \overset{105\%}{1} = 1,0416^t - 1$

$2 = 1,0416^t$

$t = \log_{1,0416} 2 = \underline{17 \text{ tours}}$

#6 La probabilité de trouver la combinaison si elle est composée que d'un seul chiffre est de $\frac{1}{10}$

... combinaison de 2 chiffres de $\frac{1}{100}$ $\left(\frac{1}{10} \cdot \frac{1}{10}\right)$

... " " n chiffres est de $\left(\frac{1}{10}\right)^n$

#7

nb de droite		nb de pts d'intersection
1	/	0
2	X	1
3	X	3
4	X	6
⋮		⋮
n		$\frac{n(n-1)}{2}$

+2

+3

pas exponentielle

#8 $\left(\frac{989}{942}\right)^t = \frac{79}{90} t + 1$

il faut trouver t à l'aide d'une table de valeur

$t = \log_{\frac{989}{942}} \left(\frac{79}{90} t + 1\right)$

t	P	C
0	1	1
10	1,163	9,78
20	2,65	18,76
30	4,31	27,33
40	7,01	36,11
50	11,41	44,89
60	18,57	53,67
70	30,21	62,44
80	49,16	71,22
90	80	80

Go jic

#9 $\ln P = 38 - 5 \ln V$

$$e^{38-5\ln V} = P$$

#10 $t = 10 \quad P = 100 \cdot 0{,}9^{10} = 34{,}87\ \%$

Niveau normale de bactéries lorsque $P = 100$

$100 = 34{,}87\, e^{0{,}14(t-10)}$

$2{,}87 = e^{0{,}14(t-10)}$

$0{,}14(t-10) = \ln 2{,}87$

$t = 17{,}53$ jrs

La pop. de bactéries sera revenu à sa normale 17,53 jrs après le début du traitement donc 7,53 jrs après la fin de la prise des antibiotiques (donc à la fin du traitement). Donc la pop de bactéries sera revenue à sa normale plus rapidement que 10 jrs.