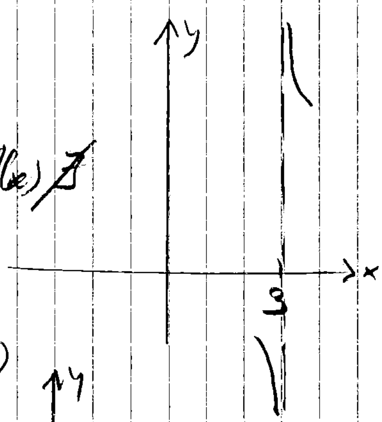
Math3N Corrigé exercices de préparation oral

Ex1 :

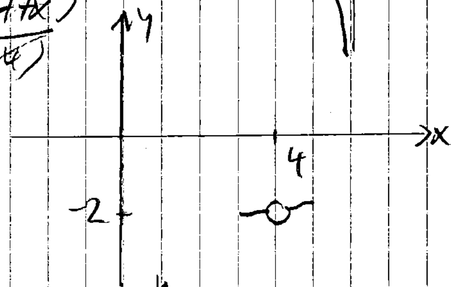
(a) type "$\frac{1}{0}$"

$$\lim_{x\to 3^-} \frac{x^2-18}{3-x} = \frac{-9}{0^+} = -\infty$$
$$\lim_{x\to 3^+} \frac{x^2-18}{3-x} = \frac{-9}{0^-} = +\infty$$
$\Big\}\ \lim_{x\to 3} f(x) \not\exists$



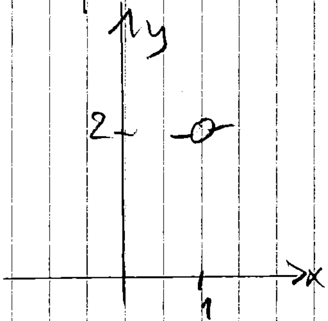
(b) type "$\frac{0}{0}$" polyn

$$\lim_{x\to 4} \frac{(4-x)(4+x)}{x(x-4)} = \lim_{x\to 4} \frac{-\cancel{(x-4)}(4+x)}{x\cancel{(x-4)}}$$
$$= -\frac{8}{4} = -2$$



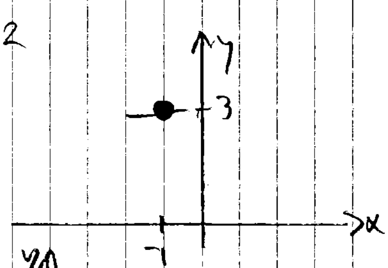
(c) type "$\frac{0}{0}$" √

$$\lim_{x\to 1} \frac{(x-1)\,(3+\sqrt{12-3x})}{(3-\sqrt{12-3x})(3+\sqrt{12-3x})}$$
$$= \lim_{x\to 1} \frac{(x-1)(3+\sqrt{12-3x})}{9-(12-3x)}$$
$$= \lim_{x\to 1} \frac{(x-1)(3+\sqrt{12-3x})}{-3+3x}$$
$$= \lim_{x\to 1} \frac{\cancel{(x-1)}(3+\sqrt{12-3x})}{3\cancel{(x-1)}} = \frac{6}{3} = 2$$



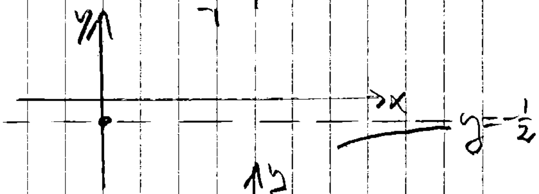
(d) direct

$$\lim_{x\to -1} f(x) = \frac{\sqrt{4}+4}{2} = 3$$



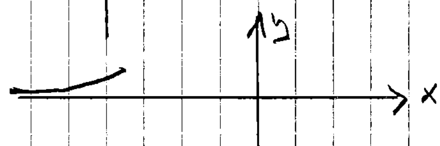
(e) type "$\frac{\infty}{\infty}$"

$$\lim_{x\to +\infty} \frac{\cancel{x^3}(-1+1/x^2)}{\cancel{x^3}(2+1/x^3)} = -\frac{1}{2}$$



(f) direct alg ∞

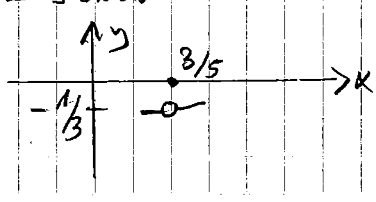
$$\lim_{x\to -\infty} f(x) = \frac{-8}{1-4(-\infty)^2} = \frac{-8}{-\infty} = 0$$



(g) type "$\frac{0}{0}$" trigo

$$\lim_{x\to 3/5} \frac{\sin(3-5x)}{-3(3-5x)} = -\frac{1}{3} \lim_{3-5x\to 0} \frac{\sin(3-5x)}{3-5x} = -\frac{1}{3}\cdot 1 = -\frac{1}{3}$$

$5x \to 3$
$5x-3 \to 0$
$-5x+3 \to 0$
$3-5x \to 0$



as. vert.: candidats $\underbrace{x=1}_{\text{type } \frac{1}{0}}$ et $\underbrace{x=-1}_{\text{type } \frac{0}{0}}$

$\hookrightarrow$ as. vert $\qquad$ $\hookrightarrow$ à voir ...

$$\lim_{x\to -1} f(x) = \lim_{x\to -1} \frac{3x^2\cancel{(x+1)}}{+2(1-x)\cancel{(1+x)}} = \frac{3}{-2\cdot 2} = -\frac{3}{4}$$ pas d'as. vert

$$\left.\begin{array}{l} \lim_{x\to 1^-} f(x) = \frac{6}{-2\cdot 0^+\cdot 2} = -\infty \\ \lim_{x\to 1^+} f(x) = \frac{6}{-2\cdot 0^-\cdot 2} = +\infty \end{array}\right\}$$ $x=1$ as. vert de f

<u>Ex3</u>: $$\left(\frac{3x^3+3x^2}{2-2x^2}\right)' = \frac{(9x^2+6x)(2-2x^2)-(3x^3+3x^2)(-4x)}{(2-2x^2)^2}$$

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

$$= \frac{3x(x+1)\cdot\cancel{2}[(3x+2)(1-x)+2x^2]}{{}_2\cancel{4}(1-x)^2(1+x)^2}$$

$$= \frac{3x(x+1)[3x+2-3x^2-2x+2x^2]}{2(1-x)^2(1+x)^2} = \frac{3x(x+1)(-x^2+x+2)}{2(1-x)^2(1+x)^2}$$

$$= \frac{3x(x+1)(-1)(x^2-x-2)}{2(1-x)^2(1+x)^2} = \frac{-3x(x+1)(x-2)(x+1)}{2(x-1)^2(x+1)^2} \underset{\text{si } x\neq -1}{=} \frac{-3x(x-2)}{2(x-1)^2}$$

remarque: on peut être plus malin

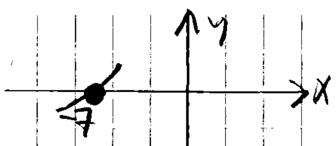
$$f(x) = \frac{3x^2(x+1)}{+2(1-x)(1+x)} \underset{\text{si } x\neq -1}{=} \frac{3x^2}{+2(1-x)}$$ on simplifie avant de dériver!

$$\Rightarrow f'(x) = \left[\frac{3x^2}{+2(1-x)}\right]' = \frac{6x(+2)(1-x)-3x^2(+2)(-1)}{[+2(1-x)]^2}$$

$$= \frac{+12x(1-x)+6x^2}{4(1-x)^2} = \frac{+12x-12x^2+6x^2}{4(1-x)^2} = \frac{-6x^2+12x}{4(1-x)^2}$$

$$= \frac{-\overset{3}{\cancel{6}}x(x-2)}{\underset{2}{\cancel{4}}(1-x)^2} = \frac{-3x(x-2)}{2(1-x)^2}$$

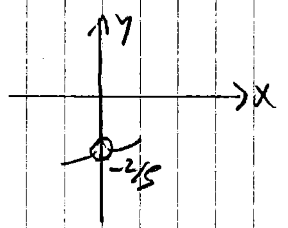
(h) direct $\lim_{x\to 7} f(x) = \frac{\sin(0)}{\cos(0)} = \frac{0}{1} = 0$



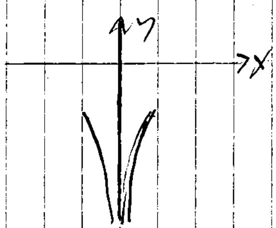
(i) type "$\frac{0}{0}$" trig $\lim_{x\to 0} \frac{\sin(-2x)}{\cos(-2x)} \cdot \frac{1}{5x} = \lim_{x\to 0} \frac{1(-2)}{5} \frac{\sin(-2x)}{-2x} \cdot \frac{1}{\cos(-2x)}$

$= \frac{-2}{5} \lim_{-2x\to 0} \frac{\sin(-2x)}{-2x} \lim_{x\to 0} \frac{1}{\cos(-2x)}$

$= -\frac{2}{5} \cdot 1 \cdot \frac{1}{\cos(0)} = -\frac{2}{5}$



(j) type "$\frac{1}{0}$" $\lim_{x\to 0^+} f(x) = \frac{4-1}{-2\cdot 0^+} = -\infty$; $\lim_{x\to 0^-} f(x) = \frac{4}{-2\cdot 0^+} = -\infty$ $\Big\}$ $\lim_{x\to 0} f(x) = -\infty$



<u>Ex 2</u>: $f(x) = \frac{3x^3+3x^2}{2-2x^2} = \frac{3x^2(x+1)}{-2(1-x)(1+x)}$

- as. horiz? non car d°(num) > d°(denom)

  vérif: $\lim_{x\to\pm\infty} \frac{x\cancel{x^2}(3+3/x)}{\cancel{x^2}(-2-2/x^2)} = \pm\infty$ pas d'as. horiz.

- as oblique?

  méthode 1: $a = \lim_{x\to\pm\infty} \frac{f(x)}{x} = \lim_{x\to\pm\infty} \frac{3x^3+3x^2}{2x-2x^3} = \lim \frac{\cancel{x^3}(3+3/x)}{\cancel{x^3}(-2+2/x^2)} = -\frac{3}{2}$

  $b = \lim_{x\to\pm\infty} f(x) - ax = \lim_{x\to\pm\infty} \frac{3x^3+3x^2}{2-2x^2} + \frac{3}{2}x = \lim_{x\to\pm\infty} \frac{\cancel{3x^3}+3x^2+6x-\cancel{6x^2}}{2-2x^2}$

  $= \lim_{x\to\pm\infty} \frac{\cancel{x^2}(3+6/x)}{\cancel{x^2}(-2+2/x^2)} = -\frac{3}{2}$

  d'où $y = -\frac{3}{2}x - \frac{3}{2}$ as. oblique de f à $\pm\infty$

  méthode 2:

$$
\begin{array}{r|l}
3x^3+3x^2 & -2x^2+2 \\
\hline
-\ (3x^3-3x) & -\frac{3}{2}x-\frac{3}{2} \\
3x^2+3x & \\
-\ (3x^2-3) & \\
3x+3 &
\end{array}
$$

d'où $(3x^3+3x^2) = (-2x^2+2)(-\frac{3}{2}x-\frac{3}{2}) + (3x+3)$

et $f(x) = (-\frac{3}{2}x - \frac{3}{2}) + \frac{3x+3}{-2x^2+2}$

donc $\lim_{x\to\pm\infty} f(x) - (-\frac{3}{2}x - \frac{3}{2}) = \lim_{x\to\pm\infty} \frac{3x+3}{-2x^2+2} = 0$

c-à-d $y = -\frac{3}{2}x - \frac{3}{2}$ as. obl. de f à $\pm\infty$

x		0		1		2	
$-3x$	+	0	−	−	−	−	−
$x-2$	−	−	−	−	−	0	+
$2(1-x)^2$	+	+	+	0	+	+	+
$f'(x)$	−	0	+	‖	+	0	−
$f(x)$	↘	m	↗	‖	↗	M	↘

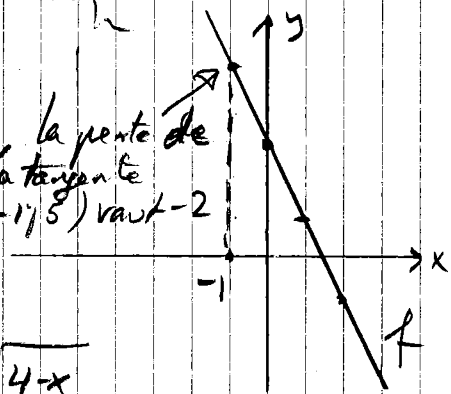
f admet un minimum en $x=0$; il vaut $f(0)=0$

" " " maximum en $x=2$; il vaut $f(2)=\frac{3\cdot 8+3\cdot 4}{2-2\cdot 4}=\frac{36}{-6}=-6$

Ex 4

(a) $f'(-1)=\lim\limits_{h\to 0}\frac{f(-1+h)-f(-1)}{h}=\lim\limits_{h\to 0}\frac{[-2(-1+h)+3]-[-2(-1)+3]}{h}$

$=\lim\limits_{h\to 0}\frac{2-2h+3-5}{h}=\lim\limits_{h\to 0}\frac{-2\cancel{h}}{\cancel{h}}=-2$



(b) $f'(x)=\lim\limits_{h\to 0}\frac{f(x+h)-f(x)}{h}=\lim\limits_{h\to 0}\frac{\sqrt{4-(x+h)}-\sqrt{4-x}}{h}$

$=\lim\limits_{h\to 0}\frac{[\sqrt{4-x-h}-\sqrt{4-x}][\sqrt{4-x-h}+\sqrt{4-x}]}{h\cdot[\sqrt{4-x-h}+\sqrt{4-x}]}$

$=\lim\limits_{h\to 0}\frac{(\cancel{4}-\cancel{x}-h)-(\cancel{4}-\cancel{x})}{h[\sqrt{4-x-h}+\sqrt{4-x}]}=\lim\limits_{h\to 0}\frac{-\cancel{h}}{\cancel{h}[\sqrt{4-x-h}+\sqrt{4-x}]}$

$=\frac{-1}{\sqrt{4-x+0}+\sqrt{4-x}}=\frac{-1}{2\sqrt{4-x}}$

Ex 5

a) $f'(x) = 2\left(\frac{1}{x}\right)' + \left(x^{1/3}\right)' - (56)' = 2\left(-\frac{1}{x^2}\right) + \frac{1}{3}x^{-2/3} - 0$

$= -\frac{2}{x^2} + \frac{1}{3}\frac{1}{\sqrt[3]{x^2}}$

b) $f'(x) = \frac{(6x-2)(x-1) - (3x^2-2x+2)}{(x-1)^2}$

c) $f'(x) = -4\left[(x^2+1)^{1/2}\right]' = -4 \cdot \frac{1}{2}(x^2+1)^{-1/2} \cdot (x^2+1)' = -2\frac{2x}{\sqrt{x^2+1}}$

d) $f'(x) = 9(4-3x)^8 \cdot (-3)(2x^2+1)^6 + (4-3x)^9 \cdot 6(2x^2+1)^5 \cdot 4x$

$= 3(4-3x)^8(2x^2+1)^5\left[-9(2x^2+1) + 8x(4-3x)\right]$

$= 3(4-3x)^8(2x^2+1)^5\left[-18x^2-9+32x-24x^2\right]$

$= 3(4-3x)^8(2x^2+1)^5\left[\underbrace{-42x^2+32x-9}_{\Delta<0 \text{ non factorisable}}\right]$

e) $f'(x) = \cos(-x)(-1) + 1 + \tan^2(x) = -\cos(-x) + 1 + \tan^2(x)$

f) $f'(x) = -\sin(x^5+x) \cdot (5x^4+1)$

g) $f'(x) = \left(\left[\cos\left(\frac{1}{4x+1}\right)\right]^{10}\right)' = 10\cos^9\left(\frac{1}{4x+1}\right) \cdot \left[\cos\left(\frac{1}{4x+1}\right)\right]'$

$= 10\cos^9\left(\frac{1}{4x+1}\right) \cdot \left(-\sin\left(\frac{1}{4x+1}\right)\right) \cdot \frac{-4}{(4x+1)^2}$

$= 40\cos^9\left(\frac{1}{4x+1}\right)\sin\left(\frac{1}{4x+1}\right)\frac{1}{(4x+1)^2}$

h) $f'(x) = 3x^2 - \left[1 \cdot \sqrt{2x} + x\left[(2x)^{1/2}\right]'\right]$

$= 3x^2 - \sqrt{2x} - x \cdot \frac{1}{2}(2x)^{-1/2} \cdot (2x)'$

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

i) $f'(x) = \left[1 + tg^2(\sin(x))\right] \cdot \cos(x)$

ex 6

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

(b) $f'(x) = \lim\limits_{h\to 0} \frac{f(x+h)-f(x)}{h} = \lim\limits_{h\to 0} \frac{\frac{1}{2(x+h)-1} - \frac{1}{2x-1}}{h} = \lim\limits_{h\to 0} \frac{\frac{(2x-1)-[2(x+h)-1]}{[2(x+h)-1][2x-1]}}{h}$

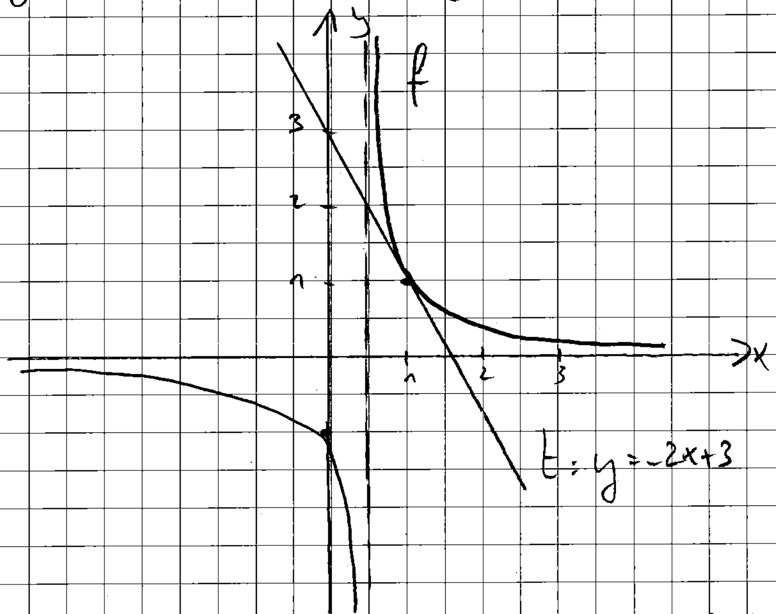
$= \lim\limits_{h\to 0} \frac{\cancel{2x}-\cancel{1}-\cancel{2x}-2h+\cancel{1}}{[2(x+h)+1][2x-1]\cdot h} = \lim\limits_{h\to 0} \frac{-2\cancel{h}}{[\dots][\dots]\cancel{h}} = \lim\limits_{h\to 0} \frac{-2}{[2(x+h)-1][2x-1]}$

$= \frac{-2}{[2(x+0)-1][2x-1]} = \frac{-2}{(2x-1)^2}$

(c) $y = f'(1)(x-1) + f(1)$: formule de l'éq. de la tg

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

$\Leftrightarrow y = -2(x-1)+1 \Leftrightarrow y = -2x+3$



ex 7

(a)
(b) $f'(x) = 12 \Leftrightarrow 3x^2-6x-60 = 12 \Leftrightarrow 3x^2-6x-72 = 0$

$\Leftrightarrow 3(x^2-2x-24) = 0 \Leftrightarrow 3(x-12)(x+2) = 0$

$x = 12$ ou $x = -2$

1re tangente : $y = 12(x-12) + f(12)$

pente 12 en (12; ...)

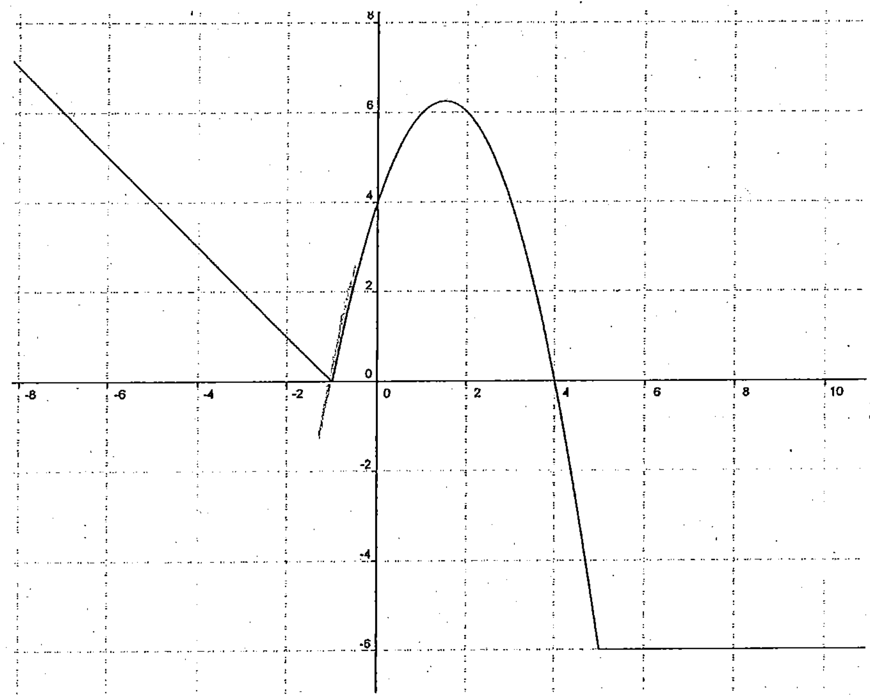
$\Leftrightarrow y = 12x - 144 + 579 = 12x + 435$

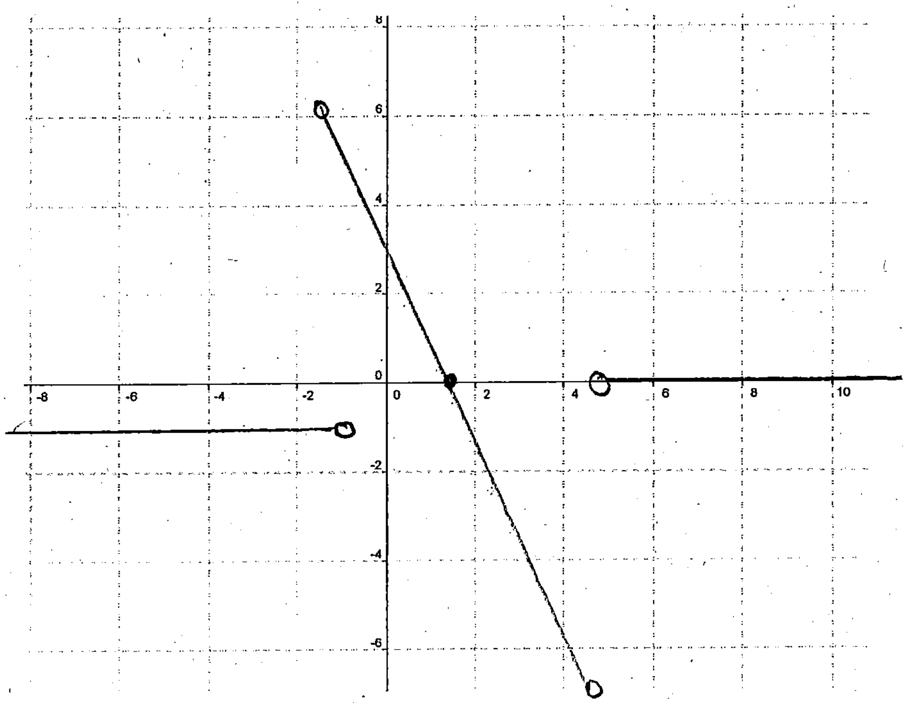
2e tg : $y = 12(x-(-2)) + f(-2)$

$\Leftrightarrow y = 12x + 24 + 103 = 12x + 127$

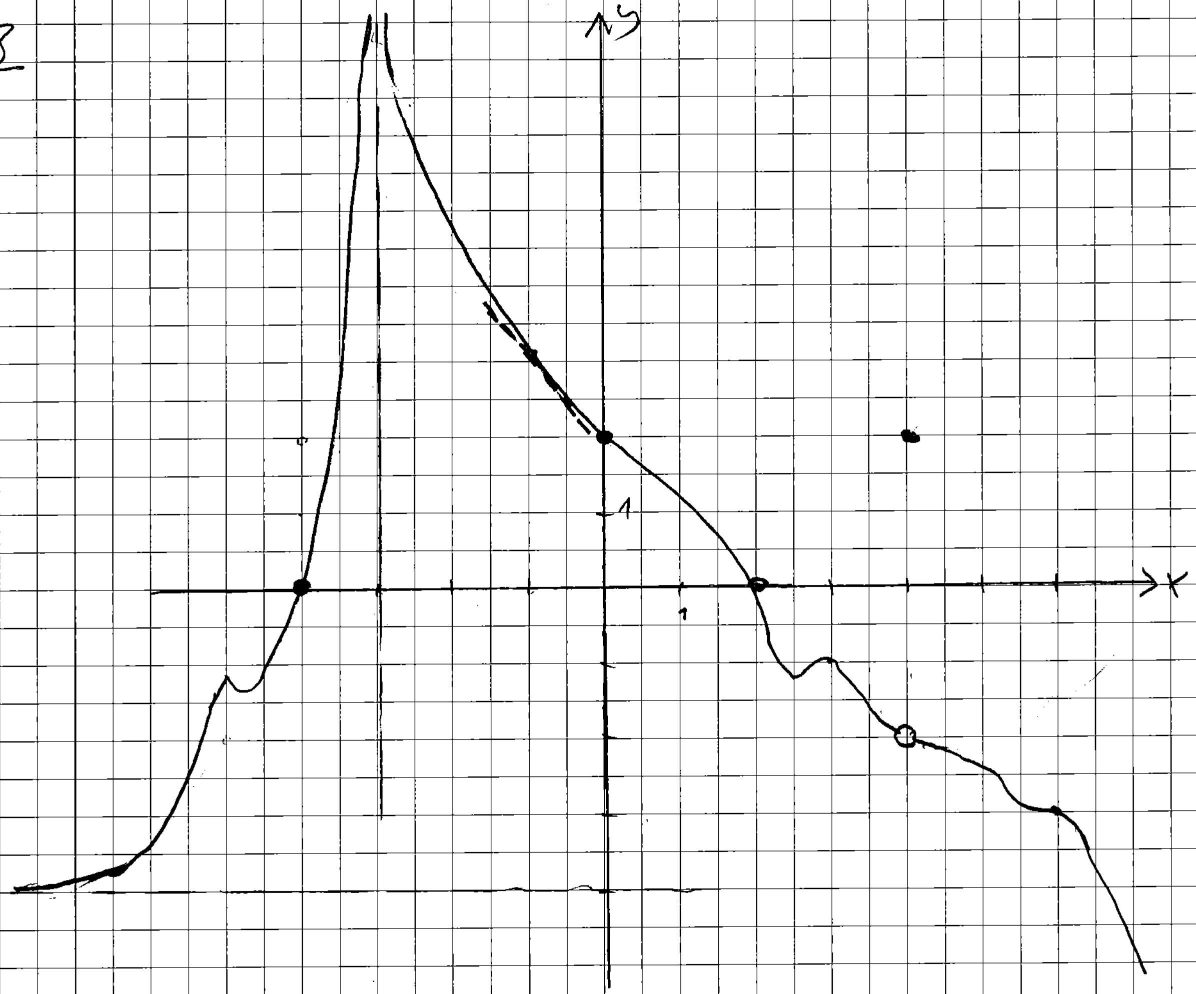
Exercice 9

On donne ci-dessous une représentation graphique d'une fonction réelle f. Tracer soigneusement une esquisse d'une représentation graphique de la fonction dérivée f' de f dans le repère supplémentaire fourni en-dessous :





ex8



ex10

(a) $\lim_{x \to -4^+} f(x) = +\infty$

(b) $\nexists$

(c) $\nexists$

(d) 2

(e) $\nexists$

(f) $\nexists$

(g) $+\infty$

(h) $-\infty$

(i) $+\infty$

(j) $+\infty$

(k) -3

ex 11

$x + y = 60 \iff y = 60 - x$

xy^3 à opt

$f(x) = x(60-x) = 60x - x^2$

$f'(x) = 60 - 2x$

x	0		30		60
$f'(x)$		+ +	0	− − −	
$f(x)$		$\nearrow$	max	$\searrow$	

les 2 nbres sont positifs, donc $x \in [0;60]$

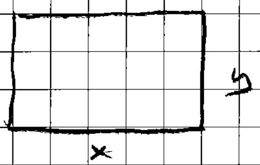
(a) $x = 30$ et $y = 30$: max pour 30 et 30

(b) on teste "les bords" : $x = 0$ et $y = 60$: $xy^3 = 0$

$x = 60$ et $y = 0$: $xy^3 = 0$

$\Rightarrow$ min pour 0 et 0

ex12



$2x + 2y = 30 \iff y = \frac{30-2x}{2} = 15 - x$

$A = xy = x(15-x) = 15x - x^2$

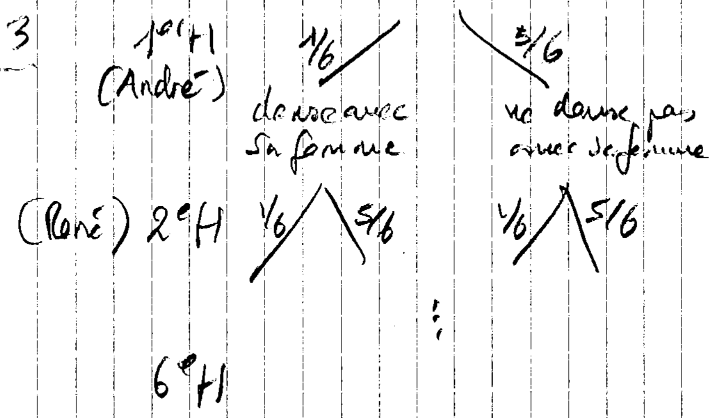
$A'(x) = 15 - 2x$

x		7,5	
$A'(x)$	+	0	−
$A(x)$	$\nearrow$	max	$\searrow$

dimensions : $x = 7{,}5$ cm et $y = 7{,}5$ cm

c'est le carré !

Ex 13



(a) $P(A) = \frac{1}{6} \cdot \frac{1}{6} \cdot \ldots \cdot \frac{1}{6} = \left(\frac{1}{6}\right)^6 = \frac{1}{216}$

(b) $P(B) = \frac{1}{6}$

(c) $P(C) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

(d) $P(D) = P(B) + P(C) - P(B \cap C) = \frac{1}{6} + \frac{1}{6} - \frac{1}{36} = \frac{6+6-1}{36} = \frac{11}{36}$

Ex 14

(a) i] $\Omega = \{ J ; R ; V ; B \}$ où J : "obtenir une boule jaune"
⋮

$p(J) = 8/20 \quad p(R) = 6/20 \quad p(V) = 4/20 \quad p(B) = 2/20$

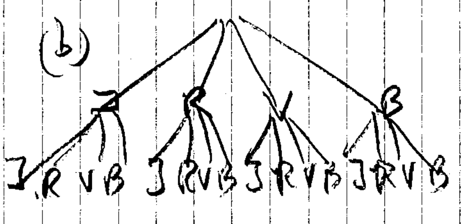
ii] $p(\overline{J}) = 1 - 8/20 = 1 - 2/5 = 3/5$

$p(R \text{ ou } V) = p(R \cup V) = p(R) + p(V) - \underbrace{p(R \cap V)}_{=0}$

$= \frac{6}{20} + \frac{4}{20} = \frac{10}{20} = \frac{1}{2}$

iii] $p(\overline{N}) = p(\Omega) = 1$

(b)



i) $p(JJ) = \frac{8}{20} \cdot \frac{7}{19} = \frac{14}{95}$

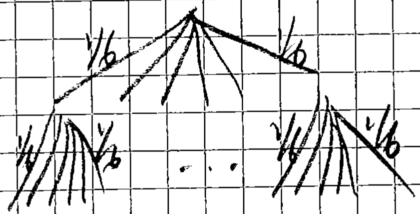
ii) $p(RV \cup VR)$

$= \frac{6}{20} \cdot \frac{4}{19} + \frac{4}{20} \cdot \frac{6}{19} = \frac{12}{95}$

ex 15

dé R

dé B



(a) i] $p(A) = \frac{1}{6} \cdot \frac{1}{6} = \frac{1}{36}$

ii] $p(B) = p(\text{"14" ou "41"}) = 2 \cdot \frac{1}{6} \cdot \frac{1}{6} = \frac{2}{36} = \frac{1}{18}$

iii] $p(C) = p(11 \cup 22 \cup \ldots \cup 66) = 6 \cdot \frac{1}{36} = \frac{1}{6}$

iv] $p(D) = p(\text{"15"} \cup \text{"51"} \cup \text{"24"} \cup \text{"42"} \cup \text{"33"}) = 5 \cdot \frac{1}{36} = \frac{5}{36}$

v] $p(E) = 1 - p(\text{"aucun 6"}) = 1 - \frac{5}{6} \cdot \frac{5}{6} = 1 - \frac{25}{36} = \frac{11}{36}$

(b) $p(B \cup D) = p(B) + p(D) - p(B \cap D) = \frac{1}{18} + \frac{5}{36} - p(\emptyset) = \frac{7}{36}$

(c) $p(C \cup D) = p(C) + p(D) - p(C \cap D) = \frac{1}{6} + \frac{5}{36} - p(\text{"33"}) = \frac{11}{36} - \frac{1}{6} = \frac{5}{36}$

ex 16 a) $p(A) = 6/12$

$p(B) = 4/12$

$p(A \cap B) = p(\text{"6" ou "12"}) = \frac{2}{12}$

$p(A) \cdot p(B) \overset{?}{=} p(A \cap B)$

$\Leftrightarrow \frac{6}{12} \cdot \frac{4}{12} \overset{?}{=} \frac{2}{12}$

$\Leftrightarrow \frac{1}{2} \cdot \frac{1}{3} \overset{?}{=} \frac{1}{6}$ oui

$\Leftrightarrow$ indépendants

b) $p(A) = 6/13$

$p(B) = 4/13$

$p(A \cap B) = p(\text{"6" ou "12"}) = \frac{2}{13}$

$p(A) \cdot p(B) \overset{?}{=} p(A \cap B)$

$\Leftrightarrow \frac{6}{13} \cdot \frac{4}{13} \overset{?}{=} \frac{2}{\cancel{13}}$

$\Leftrightarrow \frac{24}{13} \overset{?}{=} 2$ non

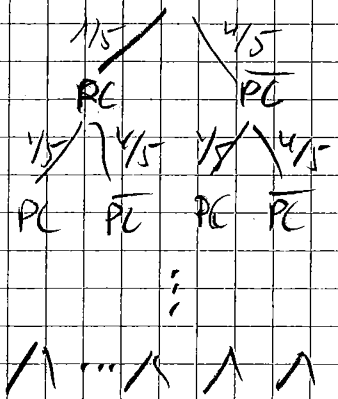
$\Leftrightarrow$ dépendants

ex 17

fig 1

fig 2

fig n



(a) A = "au moins une fois PC"

$p(A) \geq 80\%$

$\Leftrightarrow 1 - p(\text{aucun PC}) \geq 0{,}8$

$\Leftrightarrow 1 - \left(\frac{4}{5}\right)^n \geq 0{,}8$

$\Leftrightarrow \left(\frac{4}{5}\right)^n \leq 0{,}2$

$\Leftrightarrow \log\left(\frac{4}{5}\right)^n \leq \log(0{,}2)$

$\Leftrightarrow n \log\left(\frac{4}{5}\right) \leq \log(0{,}2)$

$\Leftrightarrow n \geq \frac{\log(0{,}2)}{\log(4/5)}$ $\quad \big| \div \log\left(\frac{4}{5}\right) < 0$

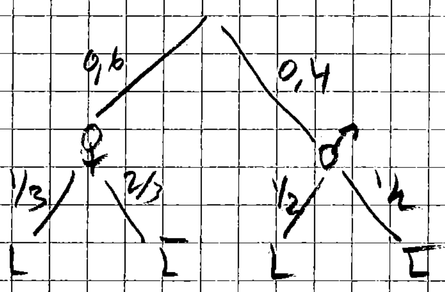
$n \gtrsim 7{,}21$

Au moins 8 paquets

(b) idem avec $p(A) \geq 90\% \Leftrightarrow \ldots \Leftrightarrow n \geq \frac{\log 0{,}1}{\log 4/5} \approx 10{,}32$

au moins 11 paquets

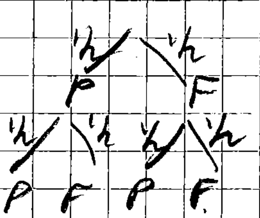
ex 18



$P(♀ | L) = \frac{P(♀ \cap L)}{P(L)}$

$= \frac{0{,}6 \cdot \frac{1}{3}}{0{,}6 \cdot \frac{1}{3} + 0{,}4 \cdot \frac{1}{2}} = 0{,}5$

ex 19



$p(A) = \frac{1}{2}$

$p(B) = \frac{3}{4}$

$p(A \cap B) = p(\text{"PP"}) = \frac{1}{4}$

$p(A)\,p(B) \stackrel{?}{=} p(A \cap B) \Leftrightarrow \frac{1}{2} \cdot \frac{3}{4} \stackrel{?}{=} \frac{1}{4}$ non

$\Leftrightarrow$ dépendants

ex 20 $p(A) = \frac{4}{52}$

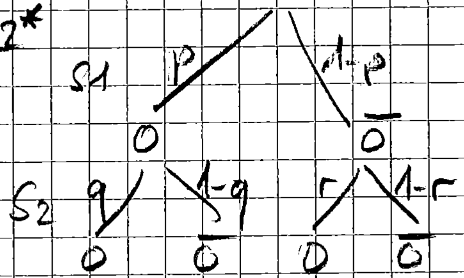
$p(B) = \frac{13}{52}$

$p(A \cap B) = \frac{1}{52}$

$\frac{4}{52} \cdot \frac{13}{52} \overset{?}{=} \frac{1}{52}$ oui $\Leftrightarrow$ indépendants

ex 21 $p(P) = \frac{1}{2}$

ex 22*



- $p(O \text{ et } O) = p \cdot q = 0{,}5$ (I)
- $1 - p(\overline{O} \text{ et } \overline{O}) = 1 - (1-p)(1-r) = 0{,}9$ (II)
- et on a : $p(S_1 \text{ occ}) = p(S_2 \text{ occ})$

$\Leftrightarrow \quad p = pq + (1-p) \cdot r$

$\Leftrightarrow \quad p = 0{,}5 + r - pr$ (III)

(II) : $1 - [1 - p - r + pr] = 0{,}9$

$\Leftrightarrow \quad p + r - pr = 0{,}9$

$\Leftrightarrow \quad r - pr = 0{,}9 - p$

dans (III) : $p = 0{,}5 + [0{,}9 - p]$

$2p = 0{,}14$

$p = 0{,}7$ $\Rightarrow$ dans (III) : $0{,}7 = 0{,}5 + r - 0{,}7r$

$\Leftrightarrow 0{,}2 = 0{,}3r$

$\Leftrightarrow r = 2/3$

dans (I) $q = \frac{0{,}5}{p} = 5/7$

(a) $P(S1\ \overline{O}) = 1 - p = 1 - 0{,}7 = 0{,}3$

(b) $P(S1\ \overline{O} \text{ et } S2\ \overline{O}) = (1-p)(1-r)$

$= 0{,}3 \cdot (1 - \frac{2}{3}) = \frac{3}{10} \cdot \frac{1}{3} = \frac{1}{10} = 0{,}1$

(c) $1 - P(S1\ O \text{ et } S2\ O) = 1 - pq = 1 - 0{,}5 = 0{,}5$

(d) $P(S1\ O \text{ et } S2\ \overline{O} \text{ ou } S1\ \overline{O} \text{ et } S2\ O) = p(1-q) + (1-p) \cdot r$

$= 0{,}7 \cdot \frac{2}{7} + 0{,}3 \cdot \frac{2}{3} = \frac{1}{5} + \frac{1}{5} = 2/5$

(e) $P(S2\ \overline{O} \mid S1\ O) = 1 - q = 2/7$

(f) $p(A) = p = 0{,}7$

$p(B) = pq + (1-p)r = 0{,}5 + 0{,}3 \cdot \frac{2}{3}$

$= 0{,}7$

$p(A \cap B) = pq = 0{,}5$

$0{,}7 \cdot 0{,}7 \overset{?}{=} 0{,}5$ non

$\Leftrightarrow$ dépendants