**B** – TEST3 – Maths Level 2 –Calculus 2017.12.19 Name

/ 58 pts without « formulaire »

## Exercise 1 / 5 pts

a) Give the definition of the derivative $f'(x) = \lim$

b) Use the definition to obtain $\left(\frac{1}{x}\right)' = -\frac{1}{x^2}$

c) How to obtain the stationary points on the graph of a given function $f$ ? And, what is the geometrical characteristic of these points ?

## Exercise 2 / 6 pts

Give the equation of the tangent to the curve $f(x) = \frac{3x+1}{4x-2}$ at $x = 3$

## Exercise 3 / 14 pts

a) Determine, with justification : $\lim_{x\to -5} \frac{x^2-25}{2x^2+6x-20}$ and $\lim_{x\to 0} \frac{x\cdot\sin(10x)}{\tan^2(2x)}$

b) Give the equation of a function whose graph has the vertical asymptote $x = -4$ and the slant asymptote $y = -2x + 1$. What's the domain of your function ?

c) Give the equation of a function whose graph has a hole at $(2; a)$ and an horizontal asymptote. Moreover the graph must intersect its horizontal asymptote at $(-4; 5)$. What's the domain of your function ? What's the value of the ordinate $a$ of the hole of your function ?

d) Find the slant and/or horizontal asymptotes of the graph of the function $f(x) = x - \sqrt{x^2 + 4x + 3}$

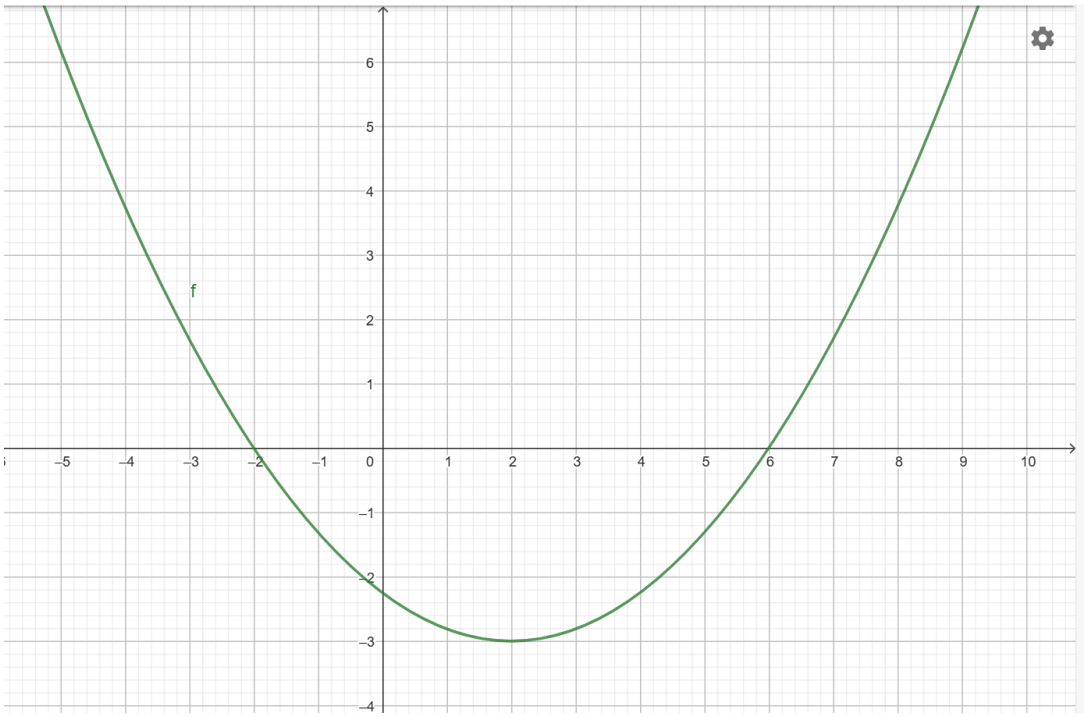
## Exercise 4 / 6 pts

The graph of a function $f$ is given. *You're not allowed to determine its equation !*

a) Estimate (with a construction) $f'(-3) \approx$

b) Give the value of $x$ that satisfies $f'(x) = 2$.

c) Plot the graph of the function $f'$.


f
6
5
4
3
2
1
−1
−2
−3
−4
−5
−4
−3
−2
−1
0
1
2
3
4
5
6
7
8
9
10

## Exercise 5 / 8 pts

Give the coordinates and types of all the critical points on the function $f(x) = -4x^5 + 5x^4 + 80x^3 - 300$.
*Your answer must be justified.*

## Exercise 6 / 7 pts

Find $a, b, c$ such that the function $f(x) = ax^3 + bx^2 + cx$ has an inflexion point at $(2; -4)$ and the tangent at its inflexion point is $t: y = 3x - 10$.

## Exercise 7 / 12 pts

a) On the graph of the function $f$, clearly place and name A: the point(s) corresponding to $f'(x) = 0$
B: the inflexion points
C: the point(s) corresponding to $f(x) = -1$

b) "At the point $D$ the curve $f$ is concave" ! True or false ?

c) Place one point $E$ on the graph such that $f(x_E) > 0, f'(x_E) < 0$ and $f''(x_E) < 0$

d) Color in ___ the part(s) of the curve that satisfy simultaneously $f(x) > 0$ and $f'(x) > 0$

Color in ___ the part(s) of the curve that satisfy $f''(x) > 0$