MAT 1339B (Winter 2018)
Assignment 2

Professor : Rachid Bentoumi

Deadline : **Friday, March 09, 2018 Before 15 :00**
(585 King Eduard math-stat department drop boxes)

Student Name _____

Student Number _____

By signing below, you declare that this work was your own and that you have not copied from any other individual or other source.

Signature _____

Late assignments will NOT be accepted; nor will unstapled assignments. Professors in the math department will not lend you a stapler.

You should complete ALL the questions in the assignments. It is possible, however, that not all the questions will be marked. In that case, the same questions will be marked in all assignments. You will not be informed beforehand which questions will be marked.

1. Find the derivatives of the following functions

(a) $f(x) = x^5 + 5^x + 5^5 + 5^\pi$

(b) $f(x) = \dfrac{\ln x}{2^x}$

(c) $f(x) = \dfrac{\sin^2(x)}{\sin(2x)}$

(d) $f(x) = 3\sin^2(2x-4) - 2\cos^2(3x+1)$

2. Determine the equation of the tangent line to the curve of $y = 8^x$ at the point $x = \frac{1}{2}$.

3. Determine the equation of the tangent line to the curve of $y = x^2 \sin(2x)$ at the point $x = -\pi$.

4. Consider the following function $f(x) = \dfrac{2x-3}{2x-4}$

(a) Determine the domain of f.

(b) Find, if it is possible, the coordinates of the intersections of f with x-axis and y-axis.

(c) Determine, if it is possible, the vertical and horizontal asymptotes.

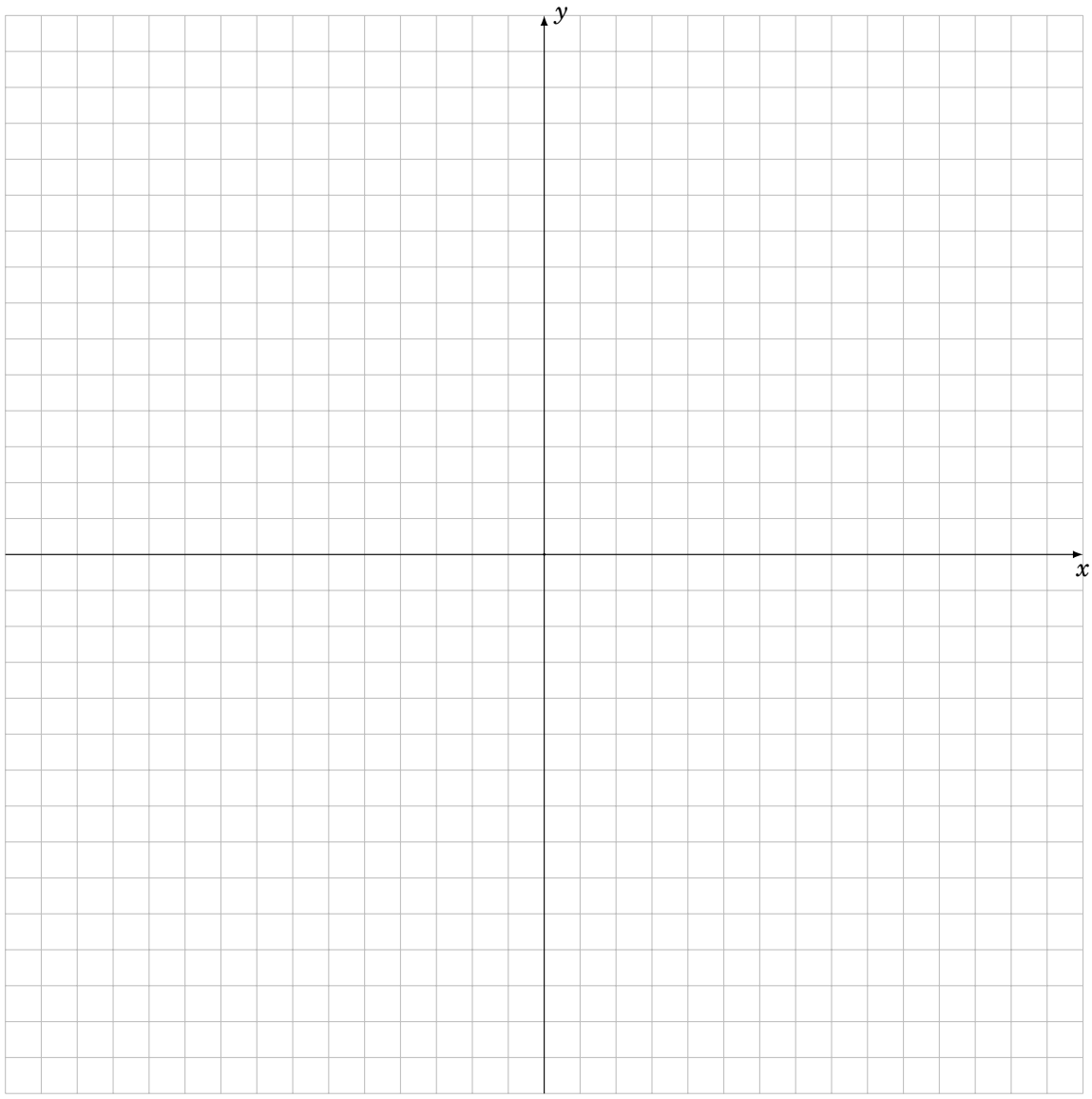
(d) Calculate the first derivative of f and find all possible critical points.

(e) Calculate the second derivative of f and find all possible inflection points.

(f) Build the variation table.

x	
$f'(x)$	
f	
$f''(x)$	
Concavity of f	

(g) Sketch the graph of the function of f



5. Sophie is charging some battery cells and monitoring the charging process. A battery charger restores the voltage of a battery cell according to the equation

$$V(t) = V_{max}\left(1 - e^{-0,12t}\right)$$

where, V represents the voltage of the cell, in volts, at time t, in hours, and V_{max} is the maximum voltage.

(a) Determine the time required to restore a dead cell's voltage to 50% of its maximum voltage.

(b) Determine an equation that expresses the rate of charging as a function of time.