Name:

Matricule number:

Regular mid-term test
Business Mathematics 1
Groups 6 and 7
Spring 2014

example	max.pts.	pts.
1	3	. . .
2	3	. . .
3	3	. . .
4	3	. . .
total :	12	. . .

Instructions:

- No documents, no calculators

- Write your answers to an example in the corresponding indicated blank spaces

- All the answers must be justified

- The clarity and readability of the copy will be taken into account in the final mark

1) a) Let $(a_n)_{n\in\mathbb{N}}$ be the sequence defined by $a_0 = 1$, $a_1 = 2$ and for $n \geq 1$, $a_{n+1} = 2 + a_n - a_{n-1}$. Calculate a_2, a_3, a_4, a_5.

b) Let $(a_n)_{n\in\mathbb{N}}$ defined by, for $n \in \mathbb{N}$,

$$a_n = \frac{n+3}{2n+1}.$$

Study the monotony of $(a_n)_{n\in\mathbb{N}}$.

2) a) Calculate

$$\sum_{k=6}^{10}(2 + 3k).$$

b) Let $S_N = \sum_{n=0}^{N} a_n$ be a geometric series so that $S_1 = 8/3$ and $\sum_{n=0}^{+\infty} a_n = 3$. Give the explicit representation of a_n for $n \in \mathbb{N}$.

3) a) Does the following equation define a valid function $f : \mathbb{R} \to \mathbb{R}^+$?

$$f(x) = \begin{cases} \sqrt{1 - x} + 1 & \text{if } x \leq \frac{1}{2} \\ \frac{1}{(x+2)^2} & \text{if } x \geq -\frac{1}{2} \end{cases}.$$

b) Let P be a quadratic function so that $P(1) = P(3)$, $P(0) = 3$ and

$$\lim_{x\to+\infty} \frac{P(x)}{x^2} = -1.$$

Calculate P.

4) a) Find the solution of the equation

$$3^x = 2e^x.$$

b) Find the value of $a \in \mathbb{R}$ so that the following function $f : \mathbb{R} \to \mathbb{R}$ is bijective.

$$f(x) = \begin{cases} x + \frac{1}{2} & \text{if } x \leq 0 \\ a(x^2 + 1) & \text{if } x > 0 \end{cases}.$$

(A graphical justification will be sufficient for this question 4)b).)

Answer to 1) a):

Answer to 1) b):

Answer to 2) a):

Answer to 2) b):

Answer to 3) a):

Answer to 3) b):

Answer to 4) a):

Answer to 4) b):

Answer to 4) b) (continued):