Université d'Ottawa · University of Ottawa

Faculté des sciences
Mathématiques et de statistique

Faculty of Science
Mathematics and Statistics

MAT1320B **Test 1** **10 October 2018**

Calculus I **Mike Newman**

LAST NAME: _____

FIRST NAME: _____

STUDENT NUMBER: _____

DGD (circle yours):	Yue	Moa	Eric	Mona	Nazanin
	10:00–11:30	11:30–13:00	13:00–14:30	14:30–16:00	16:00–17:30
	VNR 3075	VNR 5070	HNN 013	FSS 1007	MRT 212

- No calculators are permitted. No notes, books, papers of any kind, or any other aids. Scrap paper will be provided on request.
- Print your name and student number on this page.
- Verify that your copy has all 9 pages (including this one).
- Write your solutions in the space provided (use the backs of the pages if necessary). You must show all of your work.
- It is forbidden to use or have in your possesion a cellular telephone or other electronic device. Turn off your devices and put them in your bag.
- Sign below to acknowledge that you have read these instructions.

SIGNATURE: _____

- Do not write below this line.

1	2	3	4	5	6	7	8	total
/2	/1	/4	/4	/2	/2	/2	/3	/20

[**2**] **1.** Find the derivative of $f(x) = \dfrac{1}{2x+1}$ using the definition. You may not use any of the rules we saw, only the definition.

[1] **2.** Give the value(s) of a such that the function

$$g(x) = \begin{cases} (x-1)^2 + a & \text{if } x < 2 \\ 2^x + ax & \text{if } x \geq 2 \end{cases}$$

is continuous everywhere.

[4] **3.** Find each of the following limits. You may use any technique we have seen so far in the course.

a) $\lim_{x\to\infty} \dfrac{\sqrt{x^6+x^2}+x^2}{-2x^3+3x}$

b) $\lim_{x\to 1} \dfrac{(x^2-1)\sin(x-1)}{(x-1)^2}$

[4] **4.** Find each of the following derivatives. You may use any technique we have seen so far in the course. You do not need to simplify your answer.

a) $\dfrac{\mathrm{d}}{\mathrm{d}r}\left(\dfrac{re^r + 2\pi^2}{r^3 + 1}\right)$

b) $\dfrac{\mathrm{d}}{\mathrm{d}x}\left(\cos(e^{(x^2)})\right)$

[2] **5.** Find the equation of all lines that are tangent to $f(x) = 2x^2$ and pass through the point $(0, -8)$.

(hint: find the slope of the tangent line to $f(x)$ at $x = a$, then find the equation of the tangent line at $x = a$, and then find the value(s) of a that make this line pass through the given point.)

[**2**] **6.** Find an expression for y' in terms of x and y, given that $y^4 = e^x + x^2$.

[2] **7.** Consider the function $f(x) = x^{(e^x)}$. Find an expression for $f'(x)$ purely in terms of x. (hint: logarithmic differentiation.)

[3] **8.** A box with a square base is changing its height and the side of its base continuously. When the side of the base measures 2cm and the height 10cm, the side of the base is growing at the rate of 1cm/min while the height is decreasing at the rate of 2cm/min. What is the rate of change of the volume at that moment?