

School of Mathematics and Statistics
Carleton University
Math. 69.104
TEST 1

Print Name :

Student Number:

PART I: Multiple Choice Questions

Choose and CIRCLE only ONE answer

Non-programmable calculators permitted

One blank sheet for rough work permitted but DO NOT HAND IN.

1. [2 marks] Let $f(x) = \tan(2x)$. Which of the following expressions represents the value of $f'(1)$?

(a) $\lim_{h \rightarrow 0} \frac{f(h) - f(0)}{h}$, (b) $\lim_{h \rightarrow 0} \frac{f(1+h) - f(1)}{h}$, (c) $\lim_{h \rightarrow 0} \frac{f(h) - f(1)}{h}$,
(d) $\lim_{h \rightarrow 0} \frac{f(1+h) - f(1-h)}{h}$.

2. [2 marks] Evaluate the limit: $\lim_{x \rightarrow 0} x \left(1 - \cos \left(\frac{1}{x} \right) \right)$.

(a) 0 , (b) 1 , (c) The limit does not exist, (d) $+\infty$.

3. [2 marks] Let $f(x) = \sin(2x) + (\cos x)^{3/2}$. Then $f'(x)$ is equal to:

(a) $\cos(2x) - \frac{3 \sin x}{2\sqrt{\cos x}}$, (b) $2 \cos(2x) - \frac{3}{2} \sin x (\cos x)^{1/2}$,
(c) $2 \cos(2x) - \frac{1}{2\sqrt{\cos x}}$, (d) $\frac{\cos x}{2\sqrt{\sin x}}$.

4. [2 marks] Let y be given implicitly as a differentiable function of x by $x^2 \cos y + y^2 = 1$. Then the slope of the tangent line of the curve $y = y(x)$ at the point (x, y) where $x = 0$, $y = 1$ is equal to:

(a) 2, (b) $+\infty$, (c) $\frac{1}{2}$, (d) 0.

5. [2 marks] Answer TRUE or FALSE:

The function f defined by $f(x) = 3|x - 2|$ is differentiable at $x = 2$.

(a) TRUE, (b) FALSE

PART II: Show all work here.

No additional pages will be accepted

6. [5+5 marks] Find the required limits:

a) $\lim_{x \rightarrow 0^+} \frac{\sin(2x)}{3x}$.
b) $\lim_{x \rightarrow 0} \frac{1 - \cos 3x}{2x}$

7. [5+5 marks] Evaluate the required derivative of each of the following functions at the indicated point(s):

a) $f(x) = \cos(\sin(x^3))$. Find $f'(0)$.

b) $f(x) = 1 + (\tan x)^3$. Find $f'(x)$.