

FIRST NATIONS UNIVERSITY OF CANADA
DEPARTMENT OF SCIENCE
MATH110-S01-S02 200930

Midterm Test 2

Time: 50 minutes

Name: _____

Instructors:

Student #: _____

Dr. Edward Doolittle

Section: _____

(marks) You have 50 minutes to do each of the following questions. The test is worth a total of 50 marks.
Please justify your conclusions and show all your work. A non-programmable calculator of approved type is permitted. No other aids are permitted. Use the backs of the pages for rough work.

- (6) 1. Find the derivative of the function $f(x) = 3x^2 - x + 1$ from first principles.

2. Find the following derivatives. Do not simpify!

(5)

(a) y' where $y = \tan^3(2x)$

(6)

(b) $\frac{dy}{dx}$ where $y \cos x = x \sin y$

(6)

(c) The *second derivative* g'' where $g(t) = \frac{t+1}{t-1}$

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- (6) 3. Find the differential dy of $y = \sqrt{x^2 - x}$

- (6) 4. Find the second derivative d^2y/dx^2 for the implicitly defined function $x^3 + y^3 = 1$.

- (5) 5. Two cars start moving from the same point. One travels north at 80 km/h and the other travels west at 60 km/h. At what rate is the distance between the cars increasing two hours later?

- (5) 6. When blood flows along a blood vessel, the flux F (the volume of blood per unit time that flows past a given point) is proportional to the fourth power of the radius of the blood vessel:

$$F = kR^4$$

for some constant k . Find the differential dF and use it to show that the **relative** change in F , namely dF/F , is about four times the relative change in R , namely dR/R . How would a 5% increase in the radius affect the flow of blood?

(5)

7. Find $\lim_{\theta \rightarrow 0} \frac{\sin \theta}{\theta + \tan \theta}$.