

Math 124 F Autumn 2012  
Mid-Term Exam Number One  
October 23, 2012

Name: \_\_\_\_\_

Student ID no. : \_\_\_\_\_

Signature: \_\_\_\_\_

Section: \_\_\_\_\_

1	12	
2	12	
3	10	
4	10	
5	10	
6	10	
<b>Total</b>	<b>64</b>	

- Complete all questions.
- You may use a scientific calculator during this examination; graphing calculators and other electronic devices are not allowed and should be turned off for the duration of the exam.
- If you use trial-and-error, a guess-and-check method, or numerical approximation when an exact method is available, you will not receive full credit.
- You may use one double-sided, hand-written, 8.5 by 11 inch page of notes.
- Show all work for full credit.
- You have 80 minutes to complete the exam.

1. Determine the values of the following limits or state that the limit does not exist. If it is correct to say that the limit equals  $L$  or  $\infty$ , then you should do so.

(a)  $\lim_{x \rightarrow -7} \frac{x^2 + 5x - 14}{x^2 + 3x - 28}$

(b)  $\lim_{x \rightarrow 3^+} \frac{1 - x}{x^2 - 9}$

(c)  $\lim_{x \rightarrow 2} \frac{\sqrt{x^2 - 3} - \frac{1}{2}x}{x - 2}$

(d)  $\lim_{x \rightarrow \infty} \frac{3x - 5}{\sqrt{1 + 6x^2}}$

2. Find the derivatives of the following functions. Please do not simplify your results.

(a)  $f(x) = (2x^5 + x + 1)(x^2 - x - 2)$

(b)  $g(x) = \frac{x + \sin x}{e^x + \tan x}$

(c)  $h(x) = (x + \csc x)^8 + \frac{3}{\sqrt{x}}$

(d)  $j(x) = \cos(\cot x + x^2 + e^{\sec x})$

3. Bob leaves a campsite at 7 AM and walks due north at 3 km/hr.

Maria leave the campsite at 9 AM and walks due west at 5 km/hr.

(a) Determine the average rate of change of the distance between Bob and Maria from 10 AM to 10:15 AM.

(b) Determine the instantaneous rate of change of the distance between Bob and Maria at 11 AM.

4. Determine all values of  $k$  for which the function

$$g(x) = \begin{cases} 3x - 2 & \text{if } x \leq k, \\ 4 - x & \text{if } x > k \end{cases}$$

is continuous for all  $x$ .

5. Let  $f(x) = x^2 - 5x$ . Simplify the expression

$$\frac{f(x+h) - f(x-2h)}{h}$$

as much as possible.

6. Let  $(a, 1/a)$  be a point on the graph of  $y = \frac{1}{x}$ .

Find all values of  $a$  such that the tangent line to the curve  $y = \frac{1}{x}$  at  $(a, 1/a)$  passes through the point  $(1, -2)$ .