

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

**MCV4U: Choice Assignment #1**  
**Due: Wednesday, February 22<sup>nd</sup>, 2017**  
**Please answer 10 of the following 12 questions.**

1) Find the following limits if they exist

a)  $\lim_{x \rightarrow -3} \frac{x^2 - x - 12}{x + 3}$  . b)  $\lim_{x \rightarrow 3} \frac{25 - (x+2)^2}{x - 3}$  c)  $\lim_{x \rightarrow 10} \frac{(7-x)^2 - 9}{4-x}$  d)  $\lim_{x \rightarrow 1} \frac{x^2 - \sqrt{x}}{1 - \sqrt{x}}$

e)  $\lim_{x \rightarrow -6} \frac{\frac{1}{6} + \frac{1}{x}}{x + 6}$  f)  $\lim_{x \rightarrow 1/2} \frac{16x^4 - 1}{2x - 1}$  g)  $\lim_{x \rightarrow 3} \frac{x^3 - 3x^2 + 2x - 6}{x - 3}$

2) Use the difference quotient to find the slope of the tangent to each of the following functions at the given value of x:

a)  $f(x) = 3x^2 - 5$ , at  $x = 1$

b)  $f(x) = x^2 - 3x$ , at  $x = -1$

c)  $f(x) = 2x^2 + 3x - 4$ , at  $x = 0$

d)  $f(x) = (2x - 1)^2$ , at  $x = -2$

e)  $f(x) = \frac{2}{x-1}$ , at  $x = 6$

f)  $f(x) = \frac{x-3}{x}$ , at  $x = 1$

g)  $f(x) = \sqrt{3x-5}$ , at  $x = 2$

h)  $f(x) = \frac{x+3}{x-1}$ , at  $x = -4$

3) From first principles, find the derivative of each of the following functions:

a)  $f(x) = 3x^2 + 8$

b)  $y = \frac{3}{x^2}$

c)  $f(x) = \sqrt{3x+2}$

d)  $f(x) = \frac{x-1}{2+x}$

e)  $f(x) = \frac{4x^2 - 7}{x}$

f)  $f(x) = 3x^2 + x^2$

4) Find the equation of the tangent to the graph of  $y = 4 - \frac{3}{x}$  at  $x = 2$

5) Find the equation of the line that passes through the point (2, 2) and is perpendicular to the tangent to  $y = 2x - 3x^3$  at  $x = -1$ .

6) Find the equation of the tangent to  $y = 3x^2 - x$  that has slope 5.

7) Evaluate the following limits:

a)  $\lim_{x \rightarrow \infty} \frac{1 - 2x + 3x^2}{5 + x - 4x^2}$

b)  $\lim_{x \rightarrow 2} \frac{4}{(x-2)^2}$

c)  $\lim_{x \rightarrow 3^+} \frac{(x+3)}{x^2 - x - 6}$

d)  $\lim_{x \rightarrow \infty} \frac{x^2}{7 - x}$

e)  $\lim_{x \rightarrow \infty} \frac{x^5 + 1}{x^4 + x^3 - 1}$

f)  $\lim_{x \rightarrow \infty} \frac{3 - x + 7x^2}{1 - 2x^2}$

8) Evaluate the following limits:

a)  $\lim_{x \rightarrow \infty} \frac{3x-1}{2x}$

b)  $\lim_{x \rightarrow \infty} \frac{3+2x}{x^2+7x}$

c)  $\lim_{x \rightarrow 3} \left( \frac{8}{x-3} - \frac{8}{x^2-9} \right)$

d)  $\lim_{x \rightarrow 0} \left( 5x - \frac{4}{x} \right)$

e)  $\lim_{x \rightarrow 0} \frac{\sqrt{x+7} - \sqrt{7-x}}{2x}$

f)  $\lim_{x \rightarrow 1} \frac{x^2 + x - 2}{x^3 - x^2 - x + 1}$

9) Evaluate the following limits:

a)  $\lim_{x \rightarrow 0} \left( \frac{x^3 - 2x + 3}{x - 5} - 1 \right)$

b)  $\lim_{x \rightarrow 0} \frac{1 - \frac{1}{x^2}}{1 - \frac{1}{x}}$

c)  $\lim_{x \rightarrow 1} \left( 1 - \frac{1}{x} \right) \left( \frac{1}{x-1} \right)$

d)  $\lim_{x \rightarrow \infty} \left( \frac{x^3}{2x^2 - 1} - \frac{x}{2x + 1} \right)$

10) A tank holds 500L of liquid, which takes 80 minutes to drain from a hole in the bottom of the tank. The volume, V, remaining in the tank after t minutes is

$$V(t) = 500 \left( 1 - \frac{t}{80} \right)^2, 0 \leq t \leq 80$$

- How much liquid remains in the tank at 1 hour?
- What is the average rate of change of volume with respect to time from 0 minutes to 60 minutes?
- How fast is the liquid draining at 30 minutes?

11) The volume of a sphere is given by  $V(r) = \frac{4}{3}\pi r^3$

- Find the average rate of change of volume with respect to radius as the radius changes from 8cm to 12cm
- Find the rate of change of volume when the radius is 8cm.

12) Find the coordinates of the point of intersection between the lines tangent to the zeroes of  $g(x) = 4x^3 - 4x^2 + x$ .