

**Math 185 – Assignment #2****Name:** \_\_\_\_\_1. State the values of  $x$  for which the functions below are continuous.

a)  $f(x) = \sqrt{x+1}$  \_\_\_\_\_

b)  $f(x) = x^3 - 2$  \_\_\_\_\_

c)  $f(x) = \begin{cases} x & \text{for } x \geq 0 \\ -x & \text{for } x < 0 \end{cases}$  \_\_\_\_\_

2. Evaluate the following limits. Show your work.

a)  $\lim_{x \rightarrow 3} \sqrt{x^3 - 3x}$  \_\_\_\_\_

b)  $\lim_{x \rightarrow 3} \frac{x^2 - 3x}{3 - x}$  \_\_\_\_\_

3. Find the derivative of the function below using the definition.

$$y = mx + b$$

4. An oil spill is increasing in size. For the purposes of this problem, treat the oil spill as if it were a cylinder of constant height (the thickness of the layer of oil) but with increasing radius. Find the instantaneous rate of change of the surface area  $A$  of the spill with respect to its radius  $r$  for  $r = 1.5$  m.

5. Calculate the derivatives of the following functions.

a)  $f(x) = 5x^7 - 4x^3 + 3$  \_\_\_\_\_

b)  $f(t) = -10t^{19} - 6t^8 + 35t$  \_\_\_\_\_

c)  $f(r) = \frac{4p}{3}r^3 + \frac{1}{7}r^2 - 18$  \_\_\_\_\_

6. Calculate the derivative of the following function at  $x = -1$ . Show your work.

$f(x) = 2x^4 - 5x^3 + 2x$  \_\_\_\_\_

7. Calculate the instantaneous velocity for an object moving with the following function for the displacement at the time  $t = 2$  seconds.

$s = 80t - 16t^2$

8. Consider the two curves given by  $y = 2x^2 - 5x$  and  $y = 1 - 3x^2$ . For what value or values of  $x$  do the tangent lines to these two curves have equal slopes?

9. Calculate the following derivatives.

a)  $f(x) = (3x^2 + 2)^6$

b)  $f(x) = \sqrt{3x - 10x^3}$

c)  $f(T) = \frac{2T^2}{\sqrt[3]{1+4T}}$

10. Find  $dy/dx$  by differentiating the following function implicitly. When applicable, express the result in terms of  $x$  and  $y$ .

$$y^2x - \frac{5y}{x+1} + 3x = 4$$

11. Find the derivative of the following function **using the definition**. Show your work.

$$f(x) = \sqrt{3x}$$

For what values of  $x$  is the function  $f(x)$  differentiable?