

## Math 185 – Quiz #2

November 2, 2007

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

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Total: 40 points

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1. State the values of  $x$  for which the functions below are continuous. (4 points)

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

b)  $f(x) = \begin{cases} x^2 & \text{for } x > -1 \\ -1 & \text{for } x \leq -1 \end{cases}$  \_\_\_\_\_

2. Evaluate the following limit. Show your work. (3 points)

$\lim_{x \rightarrow -2} \frac{2+x}{4-x^2}$  \_\_\_\_\_

3. Calculate the slope of the line tangent to the following curve at  $x = 10$ . Show your work. (3 points)

$f(x) = x^4 - 5x^2 + 25$  \_\_\_\_\_

4. Using the **definition of derivative**, find the derivatives of the functions below with respect to  $x$ . Show your work. (8 points)

a)  $y = 5 - 2x$

b)  $f(x) = (x+1)^2$

- c) For what values of  $x$  is the function  $f(x)$  in part (b) differentiable?

5. Consider the curve given by the function  $f(x) = \frac{-x}{x^2 + 9}$ . For what values of  $x$  (if any) does the curve have a horizontal tangent line? (4 points)

6. Calculate the instantaneous velocity at  $t = 2$  seconds for an object moving with the following function for the displacement ( $s$  is in metres). (4 points)

$$s = \sqrt{(t+1)^2 + 7}$$

7. Find the slope of the line tangent to the curve of  $2y^3 + xy + 1 = 0$  at the point  $(-3, 1)$ . (4 points)

8. Calculate the following derivative with respect to  $x$ . To receive full marks, write as a single fraction and simplify fully. (4 points)

$$y = (2x + 1)\sqrt[3]{x + 3}$$

9. A drop of water in the shape of a hemisphere (half of a sphere) is sitting on a flat counter as in the diagram below. As the water in the drop evaporates, the radius  $r$  of the drop changes. Find the instantaneous rate of change  $\frac{dV}{dr}$  for the volume  $V$  of the drop and also the rate of change  $\frac{dA}{dr}$  for the **total** surface area  $A$ . Then evaluate these rates of change for  $r = 1$  mm. You may leave your answer in terms of  $\pi$ . (6 points)

