## MAT128 Test 3 (Fall 2015): Sections 2.6, 2.8-3.1

## Name:

**Directions**: Problems are equally weighted. Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). **Good luck!** 

**Problem 1** (10 pts). The side edge of a cube is known to be  $s = 10cm \pm 0.1cm$ .

a. (2 pts) What are the volume and surface area formulas for a cube with side edge s (call them V(s) and A(s))?

b. (4 pts) Use differentials to **estimate** the maximum possible error in the volume and surface area of this cube, given the stated potential error in the side edge.

c. (4 pts) What are the **actual** worst errors that could result ( $\Delta V$  and  $\Delta A$ )? How well did your estimates perform?

## **Problem 2** (10 pts).

a. (6 pts) Find the tangent line to the curve  $(x-2)^2 + (y+1)^2 = 10$  at the point (1, -4)

b. (4 pts) Then graph both the curve and the tangent line **carefully** on the axes below:



**Problem 3** (10 pts). Consider the function  $f(x) = x\sqrt{4-x^2}$  on the interval [-1,2]

a. (2 pts) How do we know for certain that f has absolute extrema on this interval?

b. (8 pts) Find the absolute maximum and absolute minimum of f on this interval. Make sure that you do a calculus-based test to decide whether an extremum is a min or a max.

**Problem 4** (10 pts). A boat is pulled into a dock by a rope attached to the bow of the boat and passing through a pulley on the dock that is 1 meter higher than the bow of the boat. If the rope is pulled in at a rate of 1 m/s, how fast is the boat approaching the dock when it is 8 meters from the dock?

