MAT 201 Spring, 2011 100 Points

- Name\_\_\_\_\_
- 1. (15 pts) Find f'(x) by the definition of the derivative (The long way!) for  $f(x) = 2x^2 5x 1$

2. Find the first derivatives (5 pts each). Do not simplify!

a. 
$$f(x) = x^2 - x^{-3} + 2\sqrt[3]{x} + \frac{2}{\sqrt{x}} + 111.234$$

b. 
$$g(x) = \frac{6x^5 + 2x^3 - 5x}{x^3 - 1}$$

c. 
$$h(x) = \sin^2 \left( x^2 + \cos(x) \right)$$

d. 
$$(x^2 - 7x)\sin(2x)$$

3. (10 pts) Find an equation of the tangent line to  $f(x) = \sqrt[3]{x^2}$  at the point P = (1,1).

4. (5 pts) Estimate  $\sqrt[3]{(1.1)^2}$  using the Linearization of a particular function *f* at a handy value of *x*.

5. (10 pts) The graph of a function f is shown. Sketch the graph of f on the same set of axes.



6. (15 pts) Find 
$$\frac{dy}{dx}$$
, given  $x^2y^3 - 5x^2 - 5y^2 = y^3 + 11.3$ 

7. (15 pts) Two sides of a triangle are 4 cm and 5 cm, respectively. The  $3^{rd}$  side keeps changing, as the angle between the other two sides increases at a rate of 0.5 radians per second. Find the rate at which the *area* of the triangle is changing when the angle

between the sides of fixed length is  $\frac{\pi}{3}$ .



8. (10 pts) The radius of a sphere is measured as 10 cm, with a possible error in measure of 0.15 cm. Use differentials to estimate the maximum possible error in the measurement of the volume of the sphere. Hint: The volume of a sphere is  $\frac{4}{3}\pi r^3$ .