NAME _____

T. A.'s NAME _____

Do all 6 problems and show all work.
Otherwise full credit will not be given.
Only use techniques already covered in class.

PROBLEM	GRADE
1 20 pts	
2 20 pts	
3 20 pts	
4 20 pts	
5 20 pts	
6 20 pts	
TOTAL	

1. a) (10 pts) Find the equation of the line perpendicular to $y = 2x - 1$ and passing through the point $P(6,1)$. Where do the two lines intersect? Use this information to find the perpendicular distance from P to the original line.

b) (10 pts) Find the center and radius of the circle

$$x^2 + y^2 - 4x + 2y - 20 = 0$$

Find the point on the circle diametrically opposite to $(-1,3)$.

2. a) (10 pts) Use the ε, δ definition of limit (only method allowed) to show that

$$\lim_{x \to 3} (x^2 + 5x + 1) = 25$$

b) (10 pts) Compute

$$\lim_{x \to 2} \frac{x^3 - x^2 + 4x - 12}{x^2 - 4}$$

Indicate how continuity is used in your argument.

3. a) Compute

$$\lim_{x \to 0} \frac{x \sin x}{\cos x - \cos^2 x}$$

b) For what constant c will the function

$$f(x) = \begin{cases} 5x + c, & \text{for } x \leq 2 \\ x^2 + 3c, & \text{for } x > 2 \end{cases}$$

be continuous for all values of x. Explain your answer, including why continuity holds for all real numbers x.

4. a) (10 pts) Using the definition of the derivative as a limit (only method allowed), compute the derivative of the function

$$f(x) = \sqrt{x^2 + 1}$$

b) Find the equation of the line tangent to the curve

$$y = \frac{x^2}{x + 1}$$

when $x = 1$.

5. Differentiate the two functions below and simplify your answers.

a) (10 pts)

$$f(x) = x(x+1)^{-4}(x+2)^3$$

b) (10 pts)

$$g(x) = \frac{\tan x}{1 + \sec x}$$

6. Differentiate the two functions below.

a) (10 pts)

$$f(x) = \left[\frac{\sin x}{1+x^2}\right]^7$$

b) (10 pts)

$$g(x) = \cos\left[(x^3 + \sin 2x)^5\right]$$