Name:

Math 1710 Exam 1

Show all work (i.e., work things out on paper, not in your head).

1. Determine the following limits (8 pts. each):

   (a): $\displaystyle\lim_{x\to 3^-} \frac{x^2+5}{x^2-9} =$

   (b): $\displaystyle\lim_{x\to 4} \frac{2x^2-9x+4}{x^2-x-12} =$

   (c): $\displaystyle\lim_{x\to 5} \frac{3-\sqrt{2x-1}}{x-5} =$

2. Let f(x) $= 2x^4 + x^2 - x - 7$.

Show that f(x) has at least one root somewhere on the real line. (15 pts.) (Hint: Try to find one somewhere between, oh, I don't know, -3 and 3! Trust me, you can't tell me <u>what</u> the root is, just that there <u>is</u> one!)

3. (a): Find, using (one of) the (limit) definitions of the derivative, the derivative of the function

$$\mathrm{f}(x)=3x^2-5x+6$$

at the point x=1. (15 pts.)

(b): Find the equation for the tangent line to the graph of $y=\mathrm{f}(x)=3x^2-5x+6$ at the point (1,f(1)). (8 pts.)

4. Find, using any method, the derivatives of the following functions (7 pts. each):

(a): $f(x) = 3x^5 - 6x^{\frac{3}{4}} + \dfrac{5}{x^2}$

(b): $f(x) = (x^2 + x + 2)(3\sin x - 5)$

(c): $f(x) = \dfrac{x^4 + 3}{2x^3 - 4x}$

(d): $h(x) = \sin(x^{\frac{1}{3}} - x)$

5. Find the slope of the tangent line to the graph of the equation

$$x^4 - 3xy^2 + 2y^5 = 12$$

at the point (2,1). (10 pts.)