MATH 113 – 31 OCTOBER 2012 – EXAM 2

Answer each of the following questions. Show all work, as partial credit may be given.

1. (10 pts.) Use the definition of the derivative to find the equation of the tangent line to the graph of the function $f(x) = \sqrt{2x+1}$ at $(a, f(a))$, $a = 4$. (Do not use any derivative rules for this problem, but compute directly the limit of the difference quotient. Be sure to show all work.)

2. (10 pts. each) Compute the first derivative of each of the following functions. You may use any derivative rule you like. Reasonable simplification is expected.

   (a) $f(x) = 2x^4 - x^3 + 5x^2 - 6$.

   (b) $g(t) = \dfrac{t^2 + t + 2}{t^2 - 1}$.

   (c) $r(y) = y^2 \sin(y)$.

   (d) $f(t) = \cos^2(2^t)$.

   (e) $s(x) = \left(\ln(x^2) + 1\right)^5$.

3. (10 pts. each) Suppose that the position of an object moving horizontally after t seconds is given by $s(t) = 2t^3 - 21t^2 + 60t$, $0 \le t \le 6$.

   (a) Find the acceleration of the object when its velocity is zero.

   (b) Find the intervals of time in which the object is moving to the right and to the left.

4. (10 pts.) Find $f'(x)$ and $f''(x)$ if $f(x) = x \tan^{-1}(x)$. Reasonable simplification is expected.

5. (10 pts.) Find $\dfrac{dy}{dx}$ when y is defined implicitly as a function of x by the formula $xy^{1/3} + y = 10$. Reasonable simplification is expected.