Math 1351-011 Exam II-A October 18, 2006

Answer the problems on **separate** paper. You do not need to rewrite the problem statements on your answer sheets. Do your own work. Show **all relevant steps** which lead to your solutions. Attach this question sheet to the front of your answer sheets.

1. (6pts) Using the definition, find the derivative of $f(x) = 2x^2 - 5x$.

2. (40pts) Using the rules of differentiation, find the derivative of each of the following functions. Simply the results, where appropriate. Write the final form of each of the derivatives using positive exponents only.

   a. $a(x) = 7x^2 - 4x^{5/3} - \dfrac{2}{x^4}$

   b. $b(x) = \dfrac{3x-4}{x^2+2x}$

   c. $c(x) = -2xe^{-2x} - e^{-2x} + 2$

   d. $d(x) = \tan^{-1} x^2 - \tan x^2$

   e. $e(x) = \ln\sqrt{x^2 + x}$

3. (8pts) Let $f(x) = x^2 \sin 2x$. Find (and simplify) $f''(x)$.

4. (8pts) Let $f(x) = 2x - \sqrt{x+1}$. Find the equation of the tangent line to the graph of $y = f(x)$ at $x = 3$.

5. (8pts) Let $s(t) = 2t^2 - 6t + 3, \quad 0 \le t \le 4,$ describe the position of a moving body. Find:

   a. where the object is advancing
   b. where the object is retreating
   c. the total distance the body travels.

6. (8pts) A person standing at the top of a tower throws a rock straight up. It is observed that 2 seconds after the person releases the rock that it reaches its maximum height and 6 seconds later it strikes the ground at the base of the tower. Find:

   a. What was the initial velocity of the rock?
   b. What was the initial height of the rock when it was released from the person's hand?
   c. What was the maximum height which the rock reached during its flight?
   d. What was the velocity of the rock when it struck the ground?

7. (8pts) Find y' for the following implicitly defined function:

   a. $x^3 - 3xy - y^4 = 11$

8. (8pts) Find the equation of the tangent line to the curve defined by $2x^2 + y^2 = 5y - 4$ at the point (1,2).

9. (8pts) An traffic accident victim is being airlifted in a helicopter from Seymour (which is 150 miles due east of Lubbock) to Lubbock. The helicopter departs Seymour at 1:00 pm. Because of weather conditions the helicopter is flying at 60 mph. The victim's parents are driving in a car from Midland (which is 80 miles due south of Lubbock) to Lubbock. They depart Midland at 2:00 pm. They are driving at a rate of 50 mph. At 3:00 pm the helicopter and the car are the same distance from Lubbock. At 3:00 pm, how fast is the distance between the helicopter and the car decreasing?