Math 130 **Exam 2** **11/14/2014**

Name: _____

Answer the questions on the exam and not on a separate sheet of paper. No work is necessary for the True/False questions. For all other questions, please circle your answers and show your work for full credit. There are 10 questions for a total of 100 points.

True or False: Please circle either true or false. No work is necessary.

1. (5 points) The function $f(x) = |x|$ has a unique tangent line at $a = 0$.
   A. True B. False

2. (5 points) If $y = 3\pi^5$, then $\dfrac{dy}{dx} = 15\pi^4$.
   A. True B. False

3. (5 points) If $p'(d)$ and $t'(d)$ are zero and $r(x) = p(x)t(x)$, then $r'(d) = 0$.
   A. True B. False

4. (5 points) The sum of two increasing functions is also an increasing.
   A. True B. False

5. (5 points) There is a relative maximum or minimum at each critical number.
   A. True B. False

Short Answer: Show your work for full credit.

6. Let $f(x) = \dfrac{x+4}{x^2}$.

   (a) (5 points) Find the critical points of f.

   (b) (5 points) Find the open interval(s) on which the function is increasing or decreasing.

   (c) (5 points) Find the relative maximum and minimum.

7. (15 points) Use the definition of the derivative to determine $f'(5)$ if $f(x) = x^2 + 3$.

8. (15 points) Find the points on the function $f(x) = 3x^2 + 3x - 4$ that have a tangent line parallel to the line $y = 2x - 3$.

9. In this problem, the function $f(x)$ satisfies

$$f(1) = 2;\ f(2) = -1;\ f(3) = 5;\ f'(1) = -3;\ f'(2) = 3;\ f'(3) = -2;\ f'(4) = 2$$

(a) (7 points) Let $G(x) = x^2 f(x)$, find $G'(1)$.

(b) (8 points) Let $H(x) = f(x^2)$. Find the derivative of $H(x)$ at $x = 2$.

10. (15 points) An airplane is flying with a steady altitude of 6 miles on a flight path that will take it directly over a radar tracking station. The distance (defined by the line of sight) between the tracking station and the plane is decreasing at a rate of 400 miles per hour when the plane is 10 miles from the station (distance is still line of sight). At this point in time, what is the speed of the plane?