Magnet Analysis 1A   Name________________________

Rose

Review Packet for Test on Applications of Differentiation

1. Find the minimum and maximum of $f(x)=\dfrac{5\ln x}{x}$ on the interval $[2,5]$. Show all work clearly. You must justify your final answer as well as the steps leading to that answer. Don't be afraid to use fancy logarithm properties to help you come to your answer. No calculator.

2. Find the minimum value of $f(x)=x^x$ for $x>0$.

3. An indecisive mouse named Novak begins at time $t = 0$ running along a number line measured in meters. His position function is $s(t) = 2\sin t + t$. There is some cheese in a mouse trap at the origin and he can't decide whether or not to go for it. At time $t = 4\pi$ he stops and takes a nap.

   a. Make a graph of Novak's velocity.

   b. Use this to make a graph of Novak's position.

   c. At what times during Novak's run does he change direction?

   d. When is he running toward the cheese?

   e. At time $t = \frac{13\pi}{6}$, is Novak speeding up or slowing down and why?

For the following functions, determine and justify all intervals when the function is increasing or decreasing, use the first or second derivative test to find and justify all relative extrema, find all intervals where the function is concave up or concave down, and find all points of inflection.

4. $f(x) = 1 - 3x + 5x^2 - x^3$

intervals where f is increasing	intervals where f is decreasing	x-coordinate of relative maxima
x-coordinate of relative minima	intervals where f is concave up	intervals where f is concave down
x-coordinate of points of inflection		

5. $f(x) = 2x + \cot x$ on $(0, 2\pi)$

intervals where *f* is increasing	intervals where *f* is decreasing	*x*-coordinate of relative maxima
x-coordinate of relative minima	intervals where *f* is concave up	intervals where *f* is concave down
x-coordinate of points of inflection		

6. Two parallel paths 50 ft apart run through the woods. Harold jogs east on one path at 6 ft/sec, while Jenny walks west on the other at 4 ft/sec. If they pass each other at time $t = 0$, how far apart are they 3 seconds later, and how fast is the distance between them changing at that moment?

7. Find an equation of the line through the point $(3, 5)$ that cuts off the least area from the first quadrant.