Math 181: Exam 2 practice

Name:_____

1. Find the equation of the tangent line to the curve $x^2 + y^2 + xy = 7$ through the point $(-3, 1)$.

2. Find the stationary points of $f(x) = x^3 - 6x^2 + 9x + 15$. Classify them as local maxima, local minima, or neither. Show correct work, including tables of signs and behavior of function.

3. Compute the derivatives.

(a) $\dfrac{d}{dx}\dfrac{e^x}{x+1}$

(b) $\dfrac{d}{dx}\tan(2x)$

(c) Recall the rule $\frac{d}{dx}\arctan x = \frac{1}{1+x^2}$. Use this rule to compute $\dfrac{d}{dx}\arctan(2x/\pi)$

(d) $\dfrac{d}{dx}\left[e^x \sin(x)\right]$

(e) $\dfrac{d}{dx}\left(\sqrt{x} + \dfrac{1}{x^2} + \ln x\right)$

(f) $\dfrac{d}{dx}\ln(1-x^3)$

4. Hillary flies on her broomstick $600ft$ above the ground at a speed of $50ft/sec$, parallel to the ground, in a direction towards the White House. How fast is her distance to the White House changing when she is $1200ft$ from it?

5. A ladder $3m$ long rests against a vertical wall. If the bottom of the ladder slides away from the wall at a rate of $1m/s$, how fast is the top of the ladder sliding down the wall when the bottom of the ladder is $1m$ from the wall?

6. Compute the linearization of the function $y = x^2 + x + 1$ at the point $x = 1$.

7. Use differentials to find a solution x to the equation $x^3 = 27.27$ that is accurate to two decimal places. [You must show valid steps.]

8. Ohm's law states that the voltage V applied to a resistor of R ohms (a unit of resistance) is

$$V = IR$$

where I is the current in amperes. Assume that V is constant. The resistance of a resistor is determined experimentally by measuring the current that an applied voltage produces. Find the relationship between the relative error dI/I in the measured value of the current and the relative error dR/R in the computed value of the resistance.

9. (a) State the definition of the derivative of a function $f(x)$ as a limit.

(b) Let $f(x) = x^2$. Use the definition of the derivative as a limit to find $f'(2)$.

10. Here are the graphs of some functions and their derivatives, in a completely random order. Try to determine which are the original functions, and which are the derivatives. Match the function with its derivative.