Math 105A/B Test One

Name:_____

1. Find the equation for the line that is tangent to the curve $f(x) = 10x + 15x^2$ at the point $(2, 80)$.

2. Let $f(x) = x^2 + x$. Use the limit definition to find $f'(x)$.

3. Let $f(x) = |x|$.

   a. Evaluate $\lim_{x \to 0} f(x)$.

   b. Evaluate $\lim_{x \to 0} f'(x)$.

4. Let $f(x) = 3 - (x-1)^2$ and $I = [0, 2]$

   a. Where on I does $f(x)$ take its maximum values?

   b. Where on I does $f(x)$ take its minimum values?

5. Find the unique solution of the IVP $f'(x) = 6x + 5$, $f(0) = -3$.

6. Use a graph of $f(x) = 3 - x^2$ to answer the following questions.

   a. Where is $f(x)$ increasing?

   b. Does $f(x)$ have a global maximum?

   c. Does $f(x)$ have an inflection point?

   d. Where is $f(x)$ concave up?

7. Explain why $f''(x) = 6x - 2$ implies that f has only one inflection point.

8. Let $f(x) = x^2 + \frac{1}{x} + 2$ for $x > 0$.

   a. Find the derivative of $f(x)$.

   b. Find an antiderivative of $f(x)$.

9. A gardener wants to enclose 1000 square meters of land **using as little fencing as possible**. The garden is to be rectangular; one side, unfenced, lies along a river. How much fencing is needed?

10. Assume $f(x)$ is differentiable and let $g(x) = f(x) + a$. Use the limit definition of derivative to prove $g'(x) = f'(x)$.