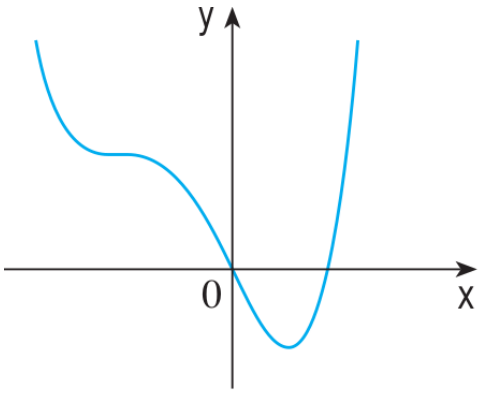
Math 125 Exam 2, Sample 2

Show all your work! Answers with no work may get no credit. No calculators or notes allowed.

1. Given the graph of $f(x)$ below, sketch a graph of $f'(x)$.



2. Differentiate:
   (a) $\sec(\sqrt[5]{x})$
   (b) $(x^2 + \log_3(|x|))^5$
   (c) $\dfrac{x^2+1}{5^x}$

3. Derive the formula for the derivative of $\sec(x)$ by first writing it in terms of sine and cosine.

4. Find an equation for the tangent line to $x + y + x^2y^2 = 5$ at the point $(2, -1)$.

5. Find an equation for the tangent line to $y = \sin^{-1}(x)$ at the point $(-1/2, -\pi/6)$.

6. Differentiate: $y = (\cos(x))^{\ln(x)}$

7. If $f(x) = 2x + e^x$, find the equation of the tangent line **to the inverse** of f at $(1, 0)$. HINT: Do not try to compute f^{-1} algebraically.

8. A population of rabbits start out at 50 rabbits. After three years there are 200 rabbits. What is the doubling time for the population? When will there be 500 rabbits?

9. A light is on the ground and points at a building 20 meters away. A man who is 2 meters tall starts at the light and runs toward the building in a straight path at the rate of 5 meters per second. How fast is the top of his shadow moving down the wall when the man is 10 meters from the light?