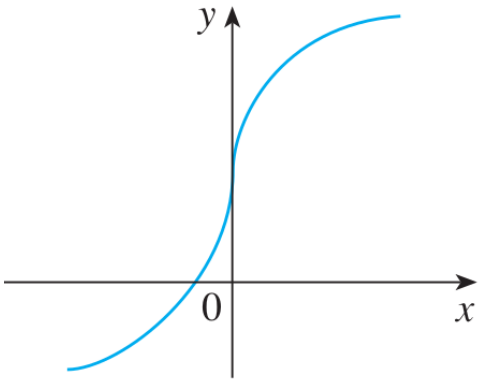
Math 125 Exam 2, Sample 1

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) $\dfrac{\cos(x)}{\sqrt{x}}$
   (b) $\sqrt{x+2^x}$
   (c) $\log_3(x)\cdot\tan(x)$
3. Derive the formula for the derivative of $\tan(x)$ by first writing it in terms of sine and cosine.
4. Find an equation for the tangent line to $\ln(x)+y^2=xy$ at the point $(1,1)$.
5. Find an equation for the tangent line to $y=\tan^{-1}(x+1)$ at the point $(0,\pi/4)$.
6. Differentiate: $y=x^{x^2}$
7. A chemist has a 300 mg sample of radioactive isotope. After 4 days, there is 75 mg remaining. Find a formula for the amount of isotope she has after t days. What is the half-life of the element?
8. A baseball player is running from second base to third base at a rate of 20 feet per second. How fast is the distance of the player from home plate decreasing when he is half way between second and third?

   Recall that a baseball diamond is a square of dimensions 90 feet by 90 feet, and home plate and second base are on opposite corners of that square.
9. Use differentials to approximate $\sqrt{99.8}$