Sample Questions for Exam #1

1. Let \( f(x) = x^3 - 3x \). Find the average rate of change of this function over the interval \([-1, 3]\). (Section 9.1)

2. Let \( f(x) = x^2 - 3x \). Calculate \( f'(3) \) directly using limits. (Section 9.2)

3. The number of different banks in the United States could be modeled by

\[
B(t) = 2.970t^3 - 68.39t^2 - 170t + 18,172 \text{ banks}
\]

where \( t \) is the number of years since 1984. In 1990, how quickly was the number of banks changing? (Estimate the appropriate derivative using a difference quotient with \( h = 0.01 \).) (Section 9.3)

4. Let \( g(x) = x^3 \).
   (a) Calculate \( g'(x) \) directly using limits. (Section 9.4)
   (b) Find the equation of the tangent line to the graph of \( g(x) \) at the point where \( x = 2 \). (Section 9.3)

5. The annual per capita income of residents of Washington state may be modeled by

\[
P(t) = -2.98t^2 + 327.4t + 7881 \text{ dollars}
\]

where \( t \) is the number of years since 1959.
   (a) Calculate \( P'(25) \). (Section 10.1).
   (b) Interpret the meaning of your result for part (a). (Section 9.5)

6. Let \( h(x) = (2x^2 + 1)(4x^3 - 8x + 9) \). Calculate \( h'(2) \). (Section 10.2)

7. Let \( S(t) = 3(t^4 - 8t^2)^7 \). Calculate \( S'(t) \). (Section 10.3)

8. Calculate \( \frac{d}{dx} \ln(\ln x) \). (Section 10.3)

9. Calculate \( \frac{d}{dx} [2^x \ln x] \). (Section 10.4)