1. (10 pts) Use the limit process to find the derivative of \( f(x) = 2x^2 + 3x \).

2. (10 pts) Find the equation of the tangent line to the graph of \( f(x) = x^3 \) at the point (2, 8).

3. (42 pts) Use the rules of differentiation to find the derivatives of the following functions. You do not need to simplify your answers.

   \begin{enumerate}
   \item \( f(x) = 5x^4 + 8x^2 - 10x + 99 \) \\
   \item \( f(x) = \sqrt{x} \) \\
   \item \( f(x) = \frac{x^5}{x^2} \) \\
   \item \( f(x) = x^2 \sin x \) \\
   \item \( f(x) = \frac{x^2 + 1}{3x + 2} \) \\
   \item \( f(x) = \cot 2x \) \\
   \item \( f(x) = (3x^5 + 1)^{10} \)
   \end{enumerate}

4. (8 pts) Let \( y = 8x^4 + 6x^3 - 2x \). Find \( \frac{d^2y}{dx^2} \).

5. (10 pts) Let \( y \) be a function of \( x \) defined implicitly by the equation \( x + y = xy \). Find the first and second derivatives of \( y \) with respect to \( x \), each expressed as a function of \( x \) and \( y \).

6. (10 pts) A machine is pouring sand into a pile. As more sand is poured, the pile gets larger. Suppose that the pile is in the shape of a right circular cone and that the radius of its base is always equal to its height. If the sand is being poured at a rate of 5 ft\(^3\)/sec, then how fast is the height of the pile growing when the height is 3 ft? Include the proper units in your answer. The formula for the volume of right circular cone is

   \[ V = \frac{1}{3} \pi r^2 h. \]

7. (10 pts) A 15-ft ladder is leaning against a wall. If the base of the ladder is moving away from the wall at 3 ft/sec, then how fast is the top of the ladder falling when the base is 9 ft from the wall?