1.) Use the limit definition of derivative to compute \( f'(x) \) for each of the following functions.
   a.) \( f(x) = \frac{1}{3 + \sqrt{x}} \)
   b.) \( f(x) = \frac{x}{x^2 + 1} \)
   c.) \( f(x) = \sin 3x \)
   d.) \( f(x) = \sqrt{3 + \sqrt{x}} \)

2.) Use any method to differentiate each of the following functions.
   a.) \( y = 1 + 5x - 6x^5 \)
   b.) \( f(x) = x^3 \sin x \)
   c.) \( y = \frac{x + 5}{x^2 \tan x} \)
   d.) \( g(x) = \frac{x \cos x}{\tan x - 5 \sec x} \)

3.) Determine a function whose derivative is:
   a.) \( f'(x) = 1 + 5x - 6x^5 \)
   b.) \( f'(x) = 4 - \sqrt{x} \)
   c.) \( y' = \frac{x^2 + 1}{x^2} \)
   d.) \( y' = \frac{4x^3 + 3x^2 + 2x + 1}{x^4 + x^3 + x^2 + x + 1} \)

4.) Use the limit definition of derivative to show that \( f(x) = |x| \) is NOT differentiable at \( x = 0 \), i.e., show that \( f'(0) \) does not exist.

5.) Use the limit definition of derivative to show that the following function IS differentiable at \( x = 1 \), i.e., show that \( f'(1) \) does exist.
   \[
   f(x) = \begin{cases} 
   2 + \sqrt{x}, & \text{if } x \geq 1 \\
   \frac{1}{2} x + \frac{5}{2}, & \text{if } x < 1 
   \end{cases}
   \]
6.) Draw a possible graph for $f'$ using the given graph of $y = f(x)$.

7.) Let $f(x) = \frac{x}{x^2 + 1}$. Solve $f'(x) = 0$ for $x$. What is the geometric significance of these $x$-values?

8.) Assume that $h(x) = f(x)g(x)$ and that $f(0) = 1$, $f'(0) = 2$, $g(0) = -1$, and $g'(0) = 3$. Determine the value of $h'(0)$.

The following problem is for recreational purposes only.

9.) A snail is at the bottom of a well which is 100 feet deep. Each day it climbs up 5 feet and back down 4 feet. In how many days will the hapless snail reach the top of the well?