1. A rock is thrown straight up into the air allowed to fall to the ground. After \( t \) seconds, the rock’s height above the ground, in feet, is given by the expression 

\[ s(t) = 7 + 10t - 16t^2 \]

(a) Write a general formula for the rock’s velocity at time \( t \).
(b) How many seconds does the rock spend traveling upward?

2. (a) Find the limit: \( \lim_{x \to 7} \frac{2x^2 - 14x}{-x + 7} \)
(b) Find the limit: \( \lim_{h \to 0} \frac{\sqrt{x + h} - \sqrt{x}}{h} \)

3. Find the equation for the tangent line to the function \( f(x) \) at the point \( (\frac{\pi}{2}, 0) \).

\[ f(x) = \cos^2(x) + 2x - \pi \]

4. Find the derivative of each function below.

(a) \( y = 3x^3 - 2x^2 + 1 \) 
(b) \( y = 2 - \sqrt[3]{x} + \frac{x}{5} \) 
(c) \( y = 3e^x + 1 \)

5. (a) Find \( \frac{d^2}{dx^2} [xe^{3x}] \) 
(b) Find \( \frac{d}{dx} \left[ \frac{6x - 7}{x^4 - x^2 + 1} \right] \)
(c) Find \( \frac{d}{dt} \left[ (\tan(x)) \cdot (x + x^3) \right] \)

6. Find \( \frac{du}{dx} \), for the relation below.

\[ (y^3 - y) x = e^y \]

7. Upon its initial start, a car travels forward so that at time \( t \), in seconds, the car has traveled \( s(t) \) feet, where 

\[ s(t) = 8.5t^2 \].

What is the acceleration of the car after 2.3 seconds?

8. Consider the function 

\[ g(x) = \begin{cases} 
4x - 3 & \text{if } x \leq 3 \\
2 & \text{if } 3 < x \leq 4 \\
\sqrt{x} & \text{if } x > 4
\end{cases} \]

(a) Sketch the graph of \( g(x) \). 
(b) Find \( \lim_{x \to 3^-} g(x) \). 
(c) Find \( \lim_{x \to 4} g(x) \).

9. (a) Find \( f'(x) \), if \( f(x) = \sin^{-1}(3x) \).
(b) Find \( g'(1) \), when \( g(x) = 1 + \tan^{-1}(x) \).

10. (a) Find \( \frac{d}{dx} \left[ \ln \left( x^3 + 4 \cos(x) \right) \right] \)
(b) If \( y = 3u + 7 \) and \( u = 6t^3 - e^t \), find \( \frac{dy}{dt} \).

11. Find the equation for all horizontal and vertical asymptotes of the function 

\[ h(x) = \frac{x^2 - 3x + 1}{x^3 - 1} \].