1. The equation for the height $h(t)$ a falling object under gravitational acceleration $g$, initial velocity $v_0$, and initial height $h_0$ is

$$h(t) = -\frac{1}{2}gt^2 + v_0t + h_0.$$ 

An astronaut is standing on the edge of a cliff on Jupiter’s moon, Io. He throws a rock straight up, and it reaches its maximum height 2 seconds after it is thrown. This maximum height is 36 meters above the bottom of the cliff. The gravitational acceleration on Io is $g = 2 \text{ m/s}^2$.

(a) What is the initial velocity of the rock?
(b) What is the height of the cliff?
(c) At what time does the rock hit the ground?
(d) What is the impact velocity of the rock? (Velocity when the rock hits the ground)
2. Consider the function

\[ f(x) = (x^2 + 3x - 4)^3 \]

(a) Find \( f'(x) \).

(b) Find all points \( x \) where the graph of \( f \) has a horizontal tangent line.