Let \( f(x) = 2x^2 + 1 \).

(a) Use limits to determine whether the graph of \( f(x) \) has any horizontal asymptotes. If it does, state what these asymptotes are. [Your answer must include reasoning based on the limits that you consider.]

(b) Use limits to determine whether the graph of \( f(x) \) has any vertical asymptotes. If it does, state what these asymptotes are. [Your answer must include reasoning based on the limits that you consider.]
(2) Let \( g(x) = x^3 - 3x^2 + 10 \).

(a) Determine the critical points of \( g(x) \), where \( g(x) \) is increasing and where \( g(x) \) is decreasing.

(b) Determine the intervals where \( g(x) \) is concave up and where \( g(x) \) is concave down. Find all inflection points.

(c) Find the absolute maximum and minimum values of \( g(x) \) on the interval \([-2, 1]\).
(3) Let $f(x)$ be the function with this graph:

(a) What is the domain of the function?

(b) For what values of $x$ is $f(x)$ not continuous?

(c) Find $\lim_{x \to -6} f(x)$
(d) Find \( \lim_{x \to -5^+} f(x) \)

(e) Find \( \lim_{x \to -5} f(x) \)

(f) Find \( \lim_{x \to 5^+} f(x) \)

(g) For what values of \( x \) is \( f(x) \) not differentiable?
(4) Find the derivatives of each of the following functions. State each of the differentiation rules that you use.

(a) \[ y = \frac{x + 2}{x^2 - 1} \]

(b) \[ f(x) = \sin(\cos x) \]

(c) \[ y = \ln(e^x \sqrt{x}) \]
Suppose that a bug is moving in a straight line and its position at time $t$ minutes is given by

$$s(t) = t - \sin t \text{ [cm]}.$$ 

(a) Find the velocity function $v(t)$.

(b) Find the acceleration function $a(t)$.

(c) Find the exact values of $s(\pi/6)$, $v(\pi/6)$, and $a(\pi/6)$.

(d) What is the starting point of the bug? Does it ever return to its starting point? [Must justify answer!]