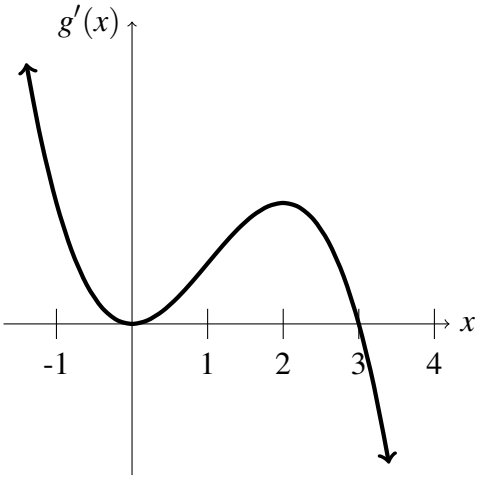
Name: _____ _____ / **25**

There are 25 points possible on this quiz. No aids (book, calculator, etc.) are permitted. **Show all work for full credit.**

1. [8 points]

Use the graph of the **derivative** of $g(x)$, namely $g'(x)$, (below) to answer the questions about the function $g(x)$.



a. Determine the critical numbers of $g(x)$.

b. Determine the intervals on which $g(x)$ is increasing and intervals on which $g(x)$ is decreasing.

c. Identify the locations (x-values) of any extrema of $g(x)$. State the type of extrema (local/absolute maximum/minimum).

d. Determine the intervals on which $g(x)$ is concave up and intervals on which $g(x)$ is concave down.

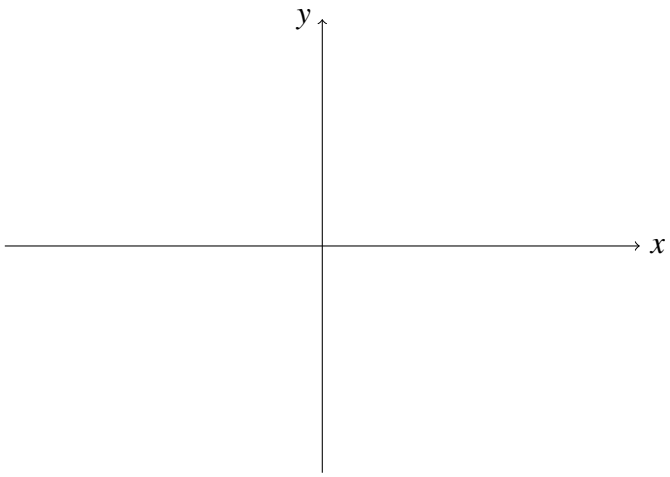
2. [6 points] Let $H(x) = \frac{2x+1}{x-9}$

a. Identify all vertical asymptotes or state that none exist. Justify your conclusion using limits.

b. Identify all horizontal asymptotes or state that none exist. Justify your conclusion using limits.

3. [3 points] On the axes below, sketch a graph of $f(x)$ that satisfies all of the properties below:

(i) $f(0) = 1$
(ii) $f'(x) > 0$ on $(-\infty, \infty)$
(iii) $f''(x) > 0$ on $(-\infty, \infty)$



4. [8 points] Evaluate the limits below. Use algebra to justify your answer.

a. $\lim_{x \to -\infty} \dfrac{x^2 + 1}{x^2 - 2x^3}$

b. $\lim_{x \to \infty} \dfrac{\sqrt{2x^4 + x}}{1 + x^2}$