10. [5 points] Suppose $g(x)$ is a differentiable function defined for all real numbers that satisfies the following properties:

- $g(x)$ has exactly two critical points.
- $g(x)$ has a local maximum at $x = 0$ and $g(0) = 4$.
- $g(x)$ has a local minimum at $x = 2$ and $g(2) = 1$.
- $\lim_{x \to -\infty} g(x) = 3$.
- $\lim_{x \to \infty} g'(x) = 1$.

Circle all of the statements below that must be true about the function g or circle NONE OF THESE if none of the statements must be true.

i. The function $g(x)$ is increasing on the entire interval $x < 0$.

ii. The function $g(x)$ is increasing on the entire interval $0 < x < 2$.

iii. The function $g(x)$ is increasing on the entire interval $x > 2$.

iv. On its domain $(-\infty, \infty)$, the function $g(x)$ attains its global maximum at $x = 0$.

v. On its domain $(-\infty, \infty)$, the function $g(x)$ attains its global minimum at $x = 2$.

vi. On its domain $(-\infty, \infty)$, the function $g(x)$ does not have a global maximum value.

Solution: Note that the fact that $\lim_{x \to \infty} g'(x) = 1$ tells us that $g(x) \to \infty$ as $x \to \infty$, since if $g(x)$ approached a finite limit, its derivative would have to approach zero.

vii. On its domain $(-\infty, \infty)$, the function $g(x)$ does not have a global minimum value.

viii. NONE OF THESE