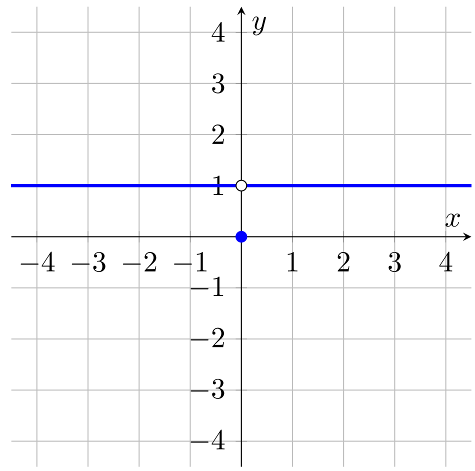
3. [8 points] For each part below, using the axes to the right, carefully draw the graph of a single function with domain $[-4, 4]$ that satisfies the given conditions. If it is not possible to do so, write NOT POSSIBLE and briefly explain why.

Make sure that any graph you draw is clear and unambiguous, and that you have carefully plotted any important points.

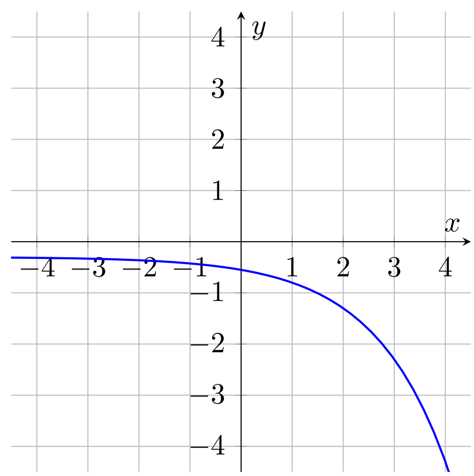
a. [2 points]

A function f with $f(0) = 0$ and $\lim_{x \to 0} f(x) = 1$.



b. [3 points]

A function g so that $g(x)$, $g'(x)$, and $g''(x)$ are each negative for all $-4 < x < 4$.



c. [3 points]

A function k with the following properties:

- $k(-3) = k(3) = 2$.
- $k(x)$ is differentiable on $(-4, 4)$.
- $k'(x)$ is never 0.

Solution: NOT POSSIBLE. k is differentiable and continuous on $[-3, 3]$. By the Mean Value Theorem, there must exist a point c in the interval $[-3, 3]$ such that

$$k'(c) = \frac{k(3) - k(-3)}{3 - (-3)} = \frac{2 - 2}{6} = 0.$$