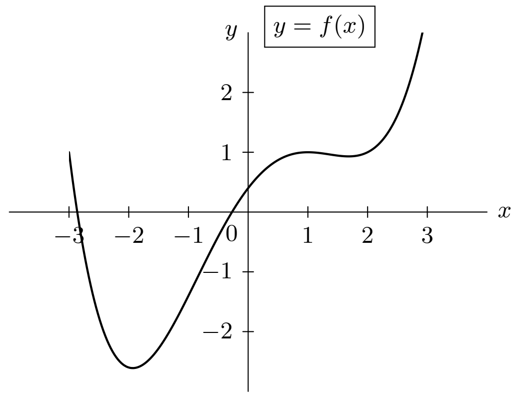
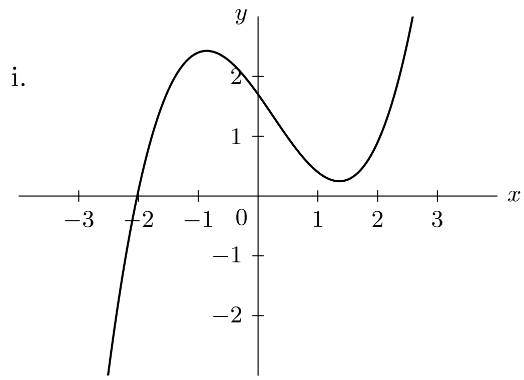
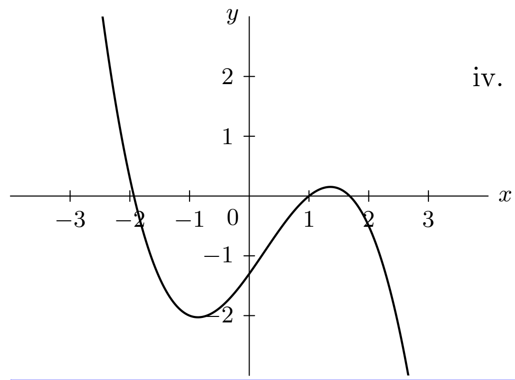
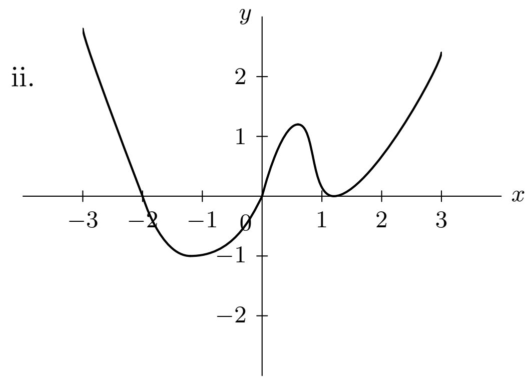
1. [5 points] Below is the graph of a function $f(x)$.

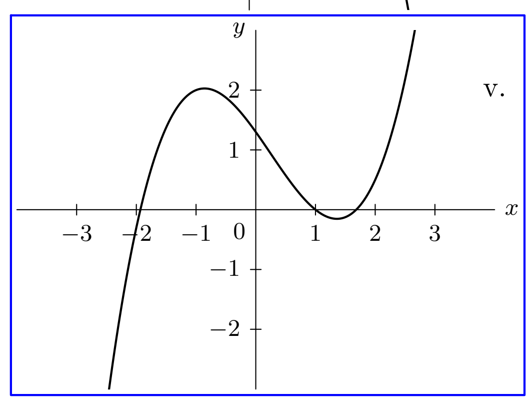


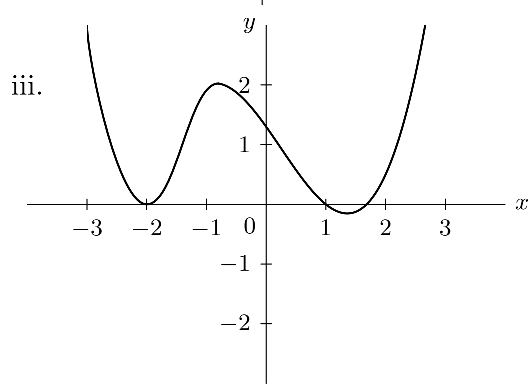
There are six graphs shown below. Circle the <u>one</u> graph that could be the graph of the derivative $f'(x)$.

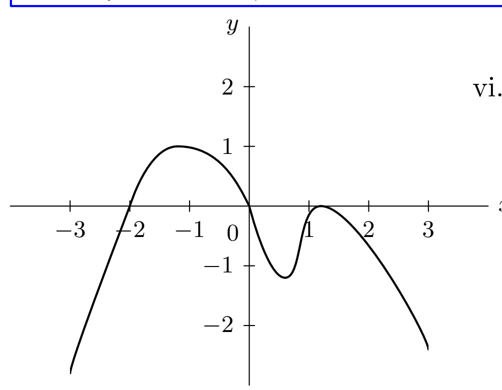




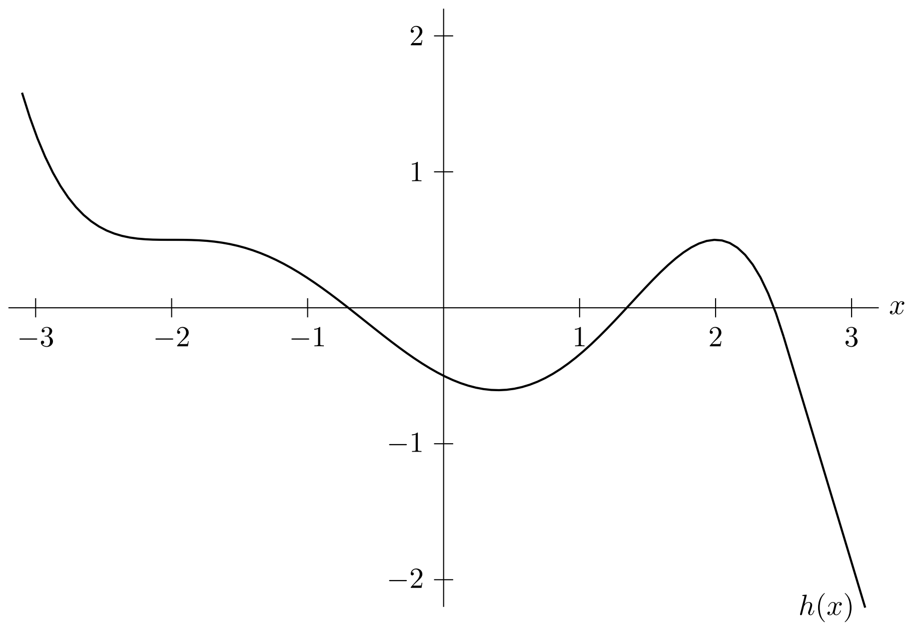




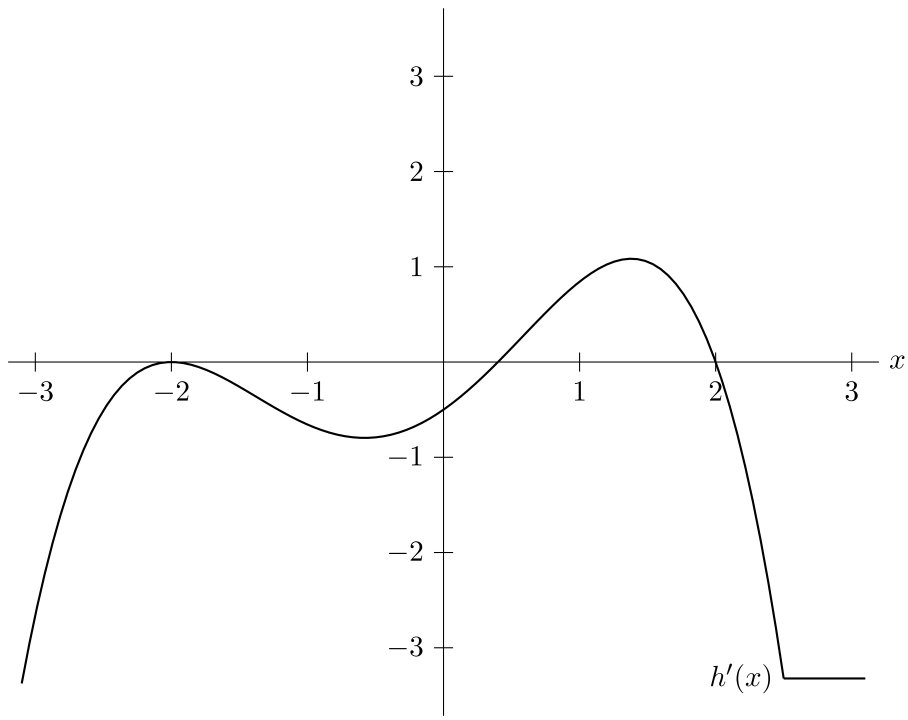




9. [10 points] Given below is the graph of a differentiable function $h(x)$ which is linear for $x > 2.5$. On the second set of axes, sketch a possible graph of $h'(x)$. Be sure your graph is drawn carefully.



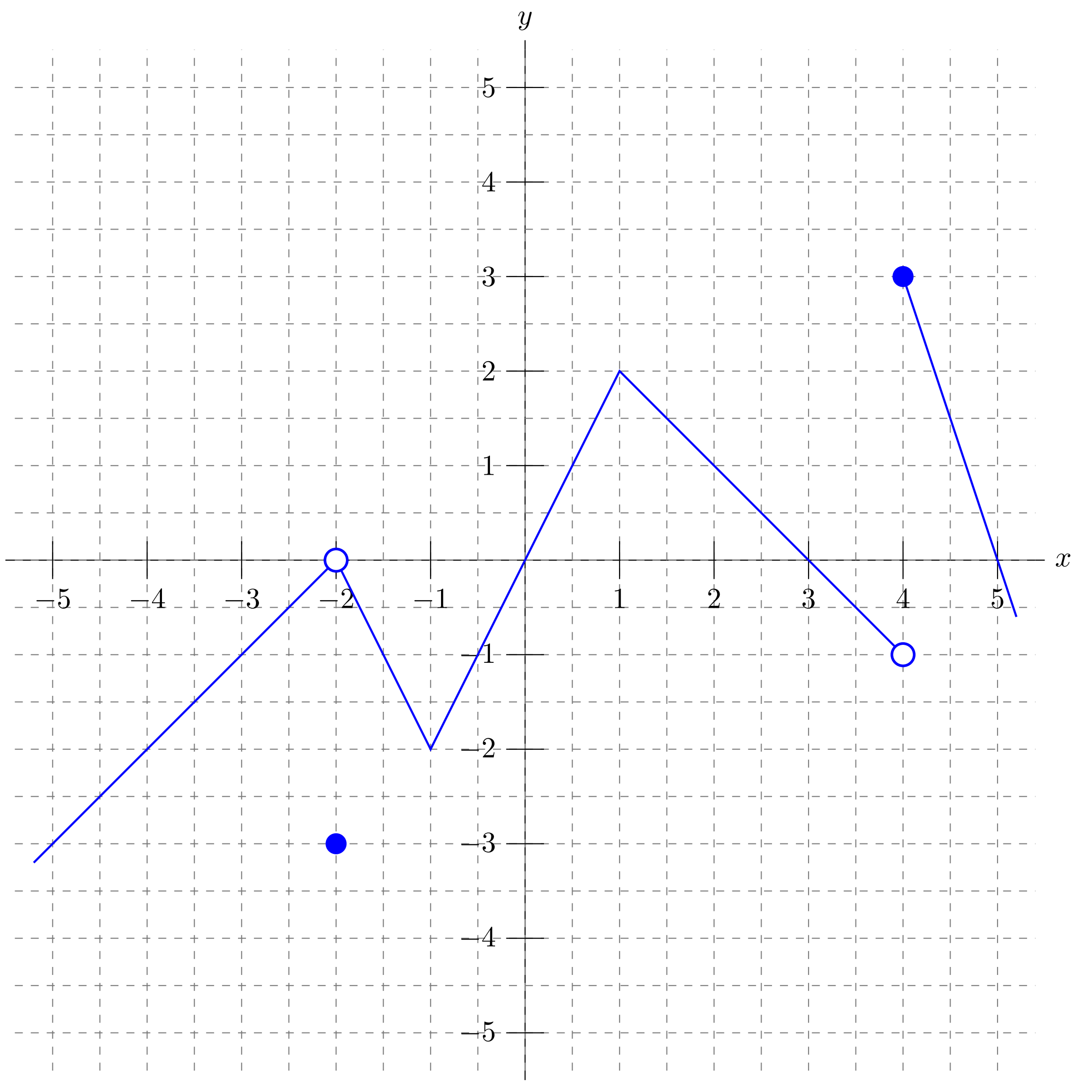
Solution:



6. [12 points] On the axes provided below, sketch the graph of a single function $y = h(x)$ satisfying all of the following:

- $h(x)$ is defined for all x in the interval $-5 < x < 5$.
- $h'(x) > 0$ for all $x < -3$.
- $\lim_{x \to -2} h(x) = 0$.
- $h(-2) = -3$.
- The average rate of change of $h(x)$ between $x = -1$ and $x = 1$ is 2.
- $h(1) = 2$.
- $h(x)$ is linear between $x = 1$ and $x = 3$.
- $h'(2) = -1$.
- $\lim_{x \to 4^-} h(x) = -1$.
- $\lim_{x \to 4} h(x)$ does not exist.
- $h'(x) < 0$ for all $x > 4$.

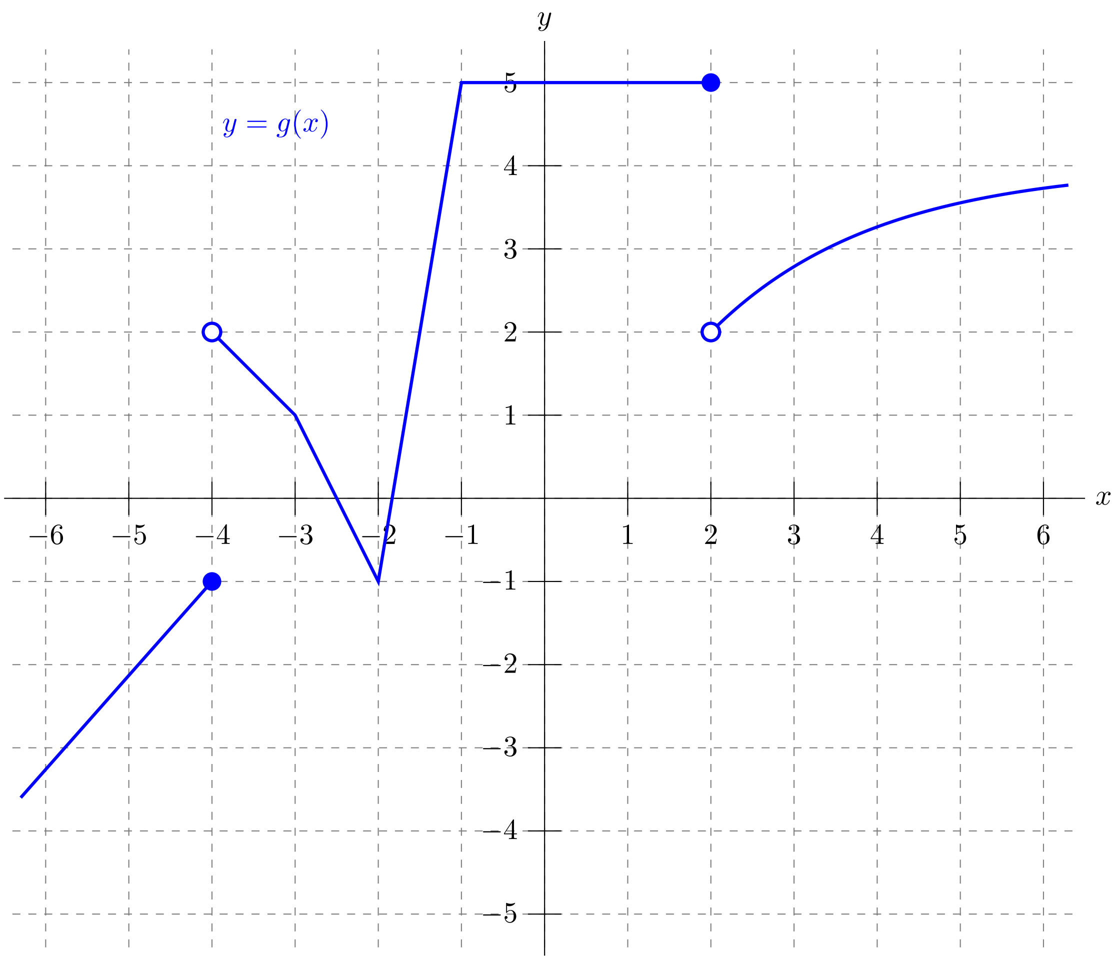
Make sure that your sketch is large and unambiguous.



6. [12 points] On the axes provided below, sketch the graph of a single function $y = g(x)$ satisfying all of the following:

- $g(x)$ is defined for all x in the interval $-6 < x < 6$.
- For all x in the interval $-6 < x < -4$, the function $g(x)$ is continuous at x and $g'(x) > 0$.
- $g(-4) = -1$.
- $\lim_{x \to -4^+} g(x) = 2$.
- $g(-3) = 1$.
- $g(-2) = -1$.
- The function $g(x)$ is continuous on the interval $[-3, -1]$.
- The average rate of change of $g(x)$ between $x = -3$ and $x = -1$ is 2.
- $g'(1) = 0$.
- $g(x)$ is not continuous at $x = 2$.
- The function $g(x)$ is continuous on the interval $3 < x < 6$.
- The slope of the tangent line to the graph of $y = g(x)$ at $x = 3$ is positive.
- $g(x)$ is increasing and concave down on the interval $4 < x < 6$.

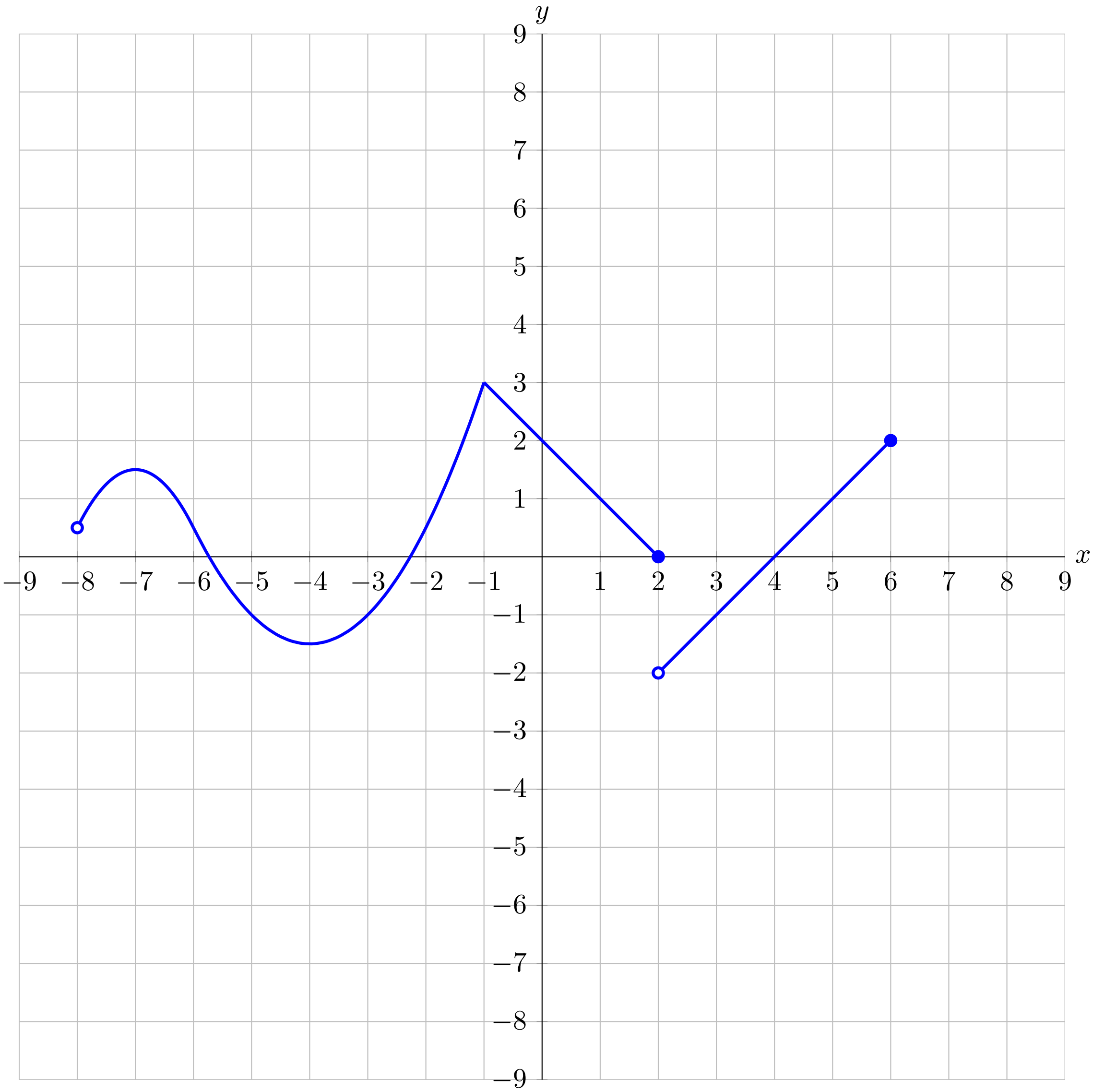
Make sure that your graph is large and unambiguous. Note that many solutions are possible.



8. [11 points] On the axes provided below, sketch the graph of a single function $y = f(x)$ satisfying all of the following conditions:

- The domain of $f(x)$ is the interval $-8 < x \leq 6$.
- $f(x)$ is continuous for all x in the interval $-8 < x < -2$.
- $f'(-7) = 0$.
- $f(x)$ is decreasing and concave up for all x in the interval $-6 < x < -4$.
- The average rate of change of $f(x)$ is equal to 0.5 between $x = -5$ and $x = -2$.
- $f(0) = 2$ and $f'(0) = -1$.
- $\lim_{x\to 2^-} f(x) = f(2)$ and $\lim_{x\to 2^+} f(x) < \lim_{x\to 2^-} f(x)$.
- $f(x)$ has constant rate of change on the interval $3 \leq x \leq 6$.

Make sure that your graph is large and unambiguous.



10. [10 points] On the axes provided below, sketch the graph of a single function $y = h(x)$ satisfying all of the following:

- $h(x)$ is defined for all x in the interval $-6 < x < 6$.
- $h'(x) < 0$ for all $x < -3$.
- $\lim_{x \to -2^+} h(x) = -1$.
- $h'(0) = 0$.
- The average rate of change of $h(x)$ between $x = -1$ and $x = 2$ is 1.
- $h(x)$ is not continuous at $x = 3$.
- $h(x) > 0$ for all $x > 3$.
- $h'(x) > 0$ for all $x > 4$.

Make sure that your sketch is large and unambiguous.