

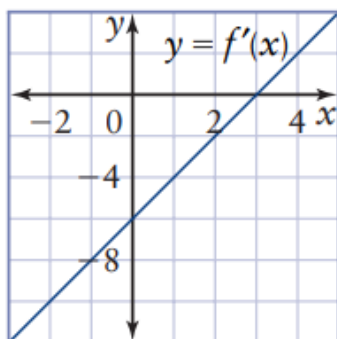
MCV4U Homework

Increasing and Decreasing Functions

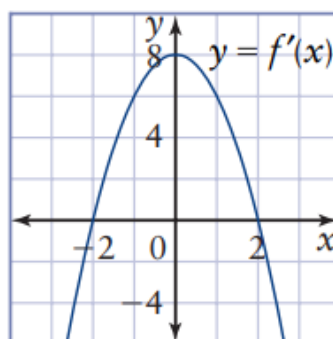
Section A: Short Questions

1. Given each graph of $f'(x)$, state the intervals of increase and decrease for the function $f(x)$.

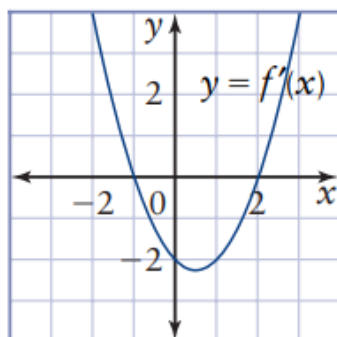
(a).



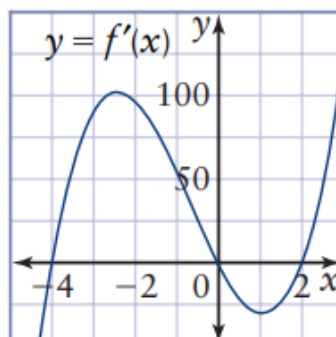
(b).



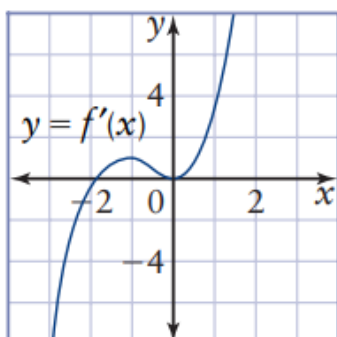
(c).



(d).

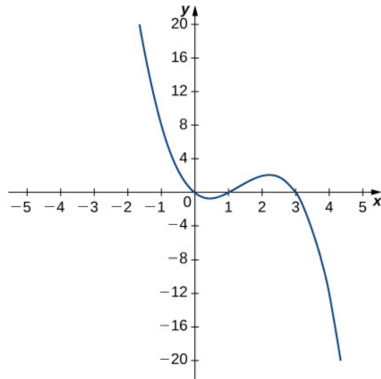


(e).

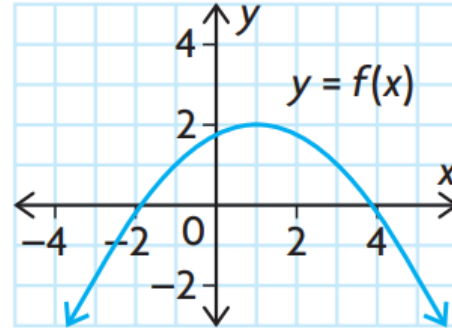


2. Given $f(x)$, sketch $f'(x)$. State the intervals of increase and decrease for the function $f'(x)$.

(a).



(b).



Section B: Problem-solving Questions

3. Sketch a graph of a function that is differentiable on the interval $-2 \leq x \leq 5$ and that satisfies the following conditions:

- The graph of f passes through the points $(-1, 0)$ and $(2, 5)$.
- The function f is decreasing on $-2 < x < -1$, increasing on $-1 < x < 2$, and decreasing again on $2 < x < 5$.

4. Sketch a graph of the function g that is differentiable on the interval $-2 \leq x \leq 5$, decreases on $0 < x < 3$, and increases elsewhere on the domain. The absolute maximum of g is 7, and the absolute minimum is -3 . The graph of g has local extrema at $(0, 4)$ and $(3, -1)$.

5. Find the intervals of increase and decrease for $f(x) = x^3 + 3x^2 + 3x$, without sketching a graph.

Answer Key

1. a) Increase: $(-\infty, \infty)$ Decrease: DNE

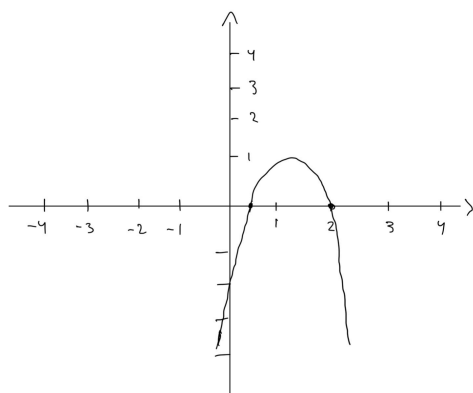
b) Increase: $(-\infty, 0)$ Decrease: $(0, \infty)$

c) Increase: $(0, \infty)$ Decrease: $(-\infty, 0)$

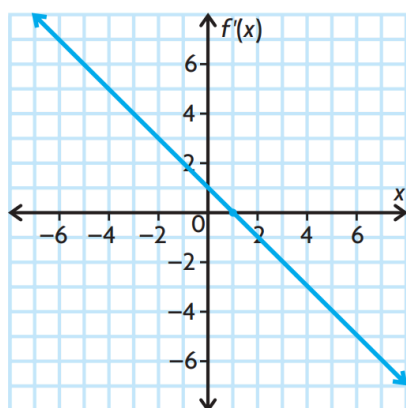
d) Increase: $(-\infty, -2) \cup (1, \infty)$ Decrease: $(-2, 1)$

e) Increase: $(-\infty, -1) \cup (1, \infty)$ Decrease: $(-1, 1)$

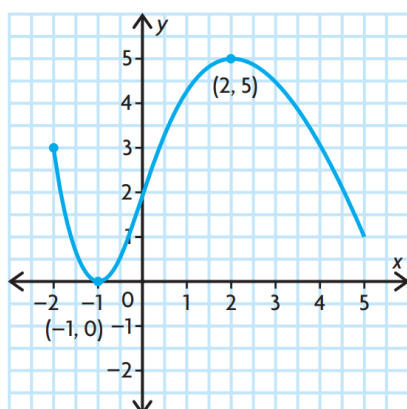
2. a)



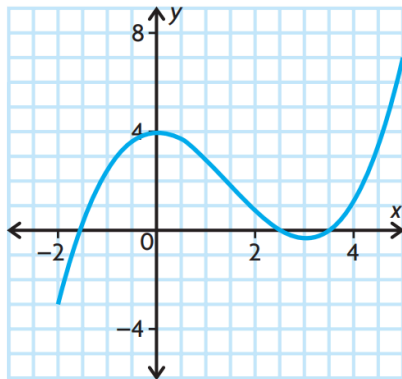
b)



3.



4.



5.

$$f(x) = x^3 + 3x^2 + 3x$$

$$f'(x) = 3x^2 + 6x + 3$$

$$f'(x) = 0$$

$$3x^2 + 6x + 3 = 0$$

$$x^2 + 2x + 1 = 0$$

$$(x+1)(x+1) = 0$$

$$x = -1$$

Interval	$(-\infty, -1)$	$x = -1$	$(-1, \infty)$
$f'(x)$	$x = -2$ $f'(-2) = 3 > 0$	0	$x = 0$ $f'(0) = 3 > 0$
$f(x)$	Increasing	Flat	Increasing

Increasing at intervals $(-\infty, -1) \cup (-1, \infty)$