

10.1

HW: pg 483 #3-6, 22, C1

Sums and Differences of Functions

Focus on...

- sketching the graph of a function that is the sum or difference of two functions
- determining the domain and range of a function that is the sum or difference of two functions
- writing the equation of a function that is the sum or difference of two functions

Example: graph the following

● $f(x) = 3x - 1 \quad -3 \leq x \leq 7$

● $g(x) = 2x + 3 \quad -6 \leq x \leq 3$

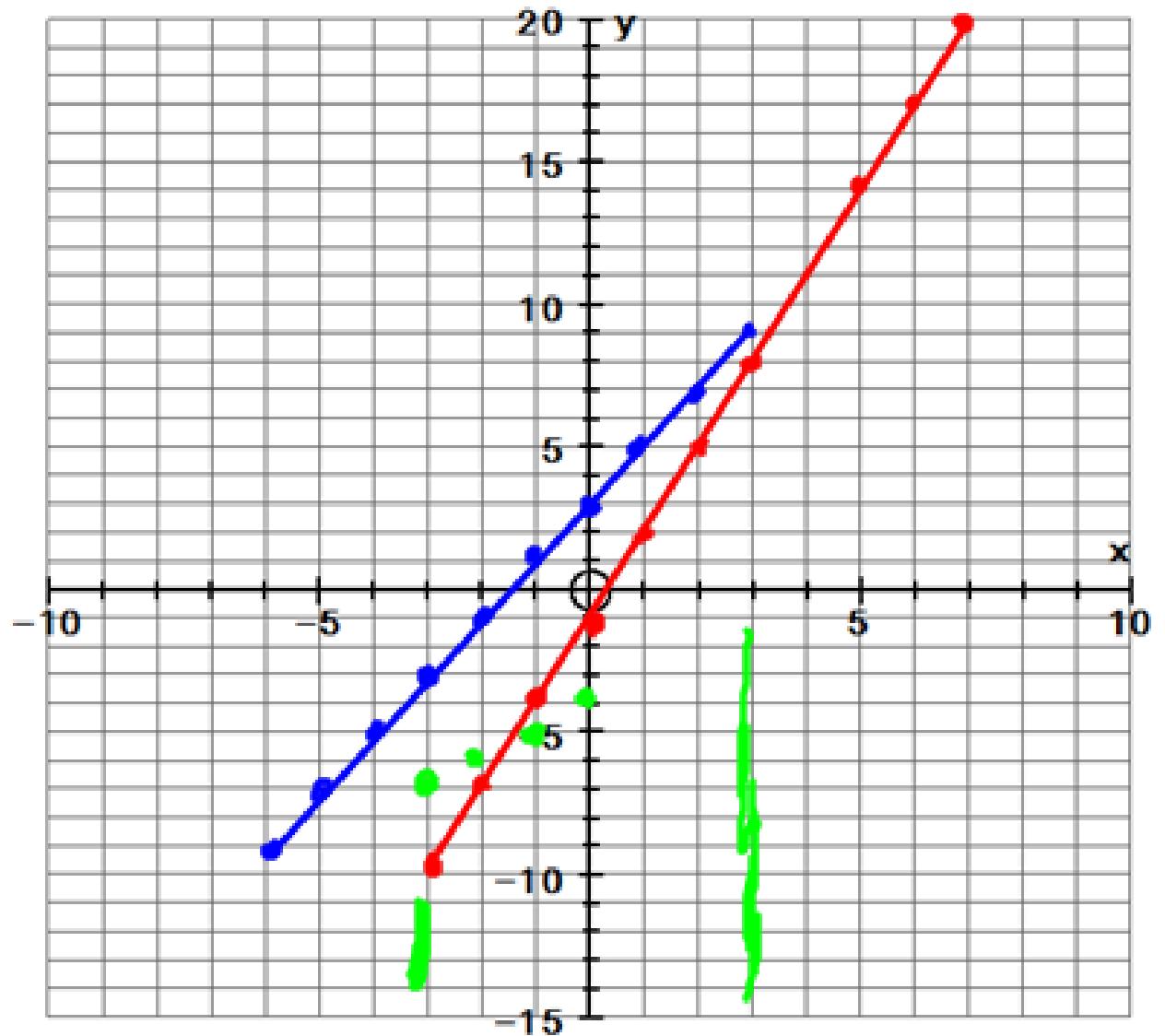
$$h(x) = f(x) + g(x)$$

- add the y values
of each function
for the same x value

- both functions
need to be defined
on the interval

$$p(x) = f(x) - g(x)$$

$$q(x) = g(x) - f(x)$$



Create a table of values to show the following:

⊕

x	$f(x)$	$g(x)$	$h(x) = f(x) + g(x)$	$p(x) = f(x) - g(x)$
-3	-10	-3	$-10 + (-3) = -13$	$-10 - (-3) = -7$
-2	-7	-1	-8	-6
-1	-4	1	-3	-5
0	-1	3	+2	-4
1	2	5	7	-3
2	5	7	12	-2
3	8	9	17	-1

$$\begin{array}{c}
 | x | 3x-1 | 2x+3 | (3x-1) + (2x+3) | (3x-1) - (2x+3) | \\
 \hline
 h(x) = 5x+2 \quad p(x) = x-4
 \end{array}$$

Domain of $f(x)$:

$$f(x) = 3x - 1 \leftarrow \text{linear}$$

$$\{x \mid x \in \mathbb{R}\} \leftarrow \text{typically}$$

$$\{x \mid -3 \leq x \leq 7\}$$

Domain of $f(x) + g(x)$:

$$h(x) = f(x) + g(x)$$

$$= 5x + 2$$

$$\{x \mid -3 \leq x \leq 3\}$$

Domain of $g(x)$:

$$g(x) = 2x + 3$$

$$\{x \mid -6 \leq x \leq 3\}$$

Domain of $f(x) - g(x)$:

$$p(x) = x - 4$$

$$\{x \mid -3 \leq x \leq 3\}$$

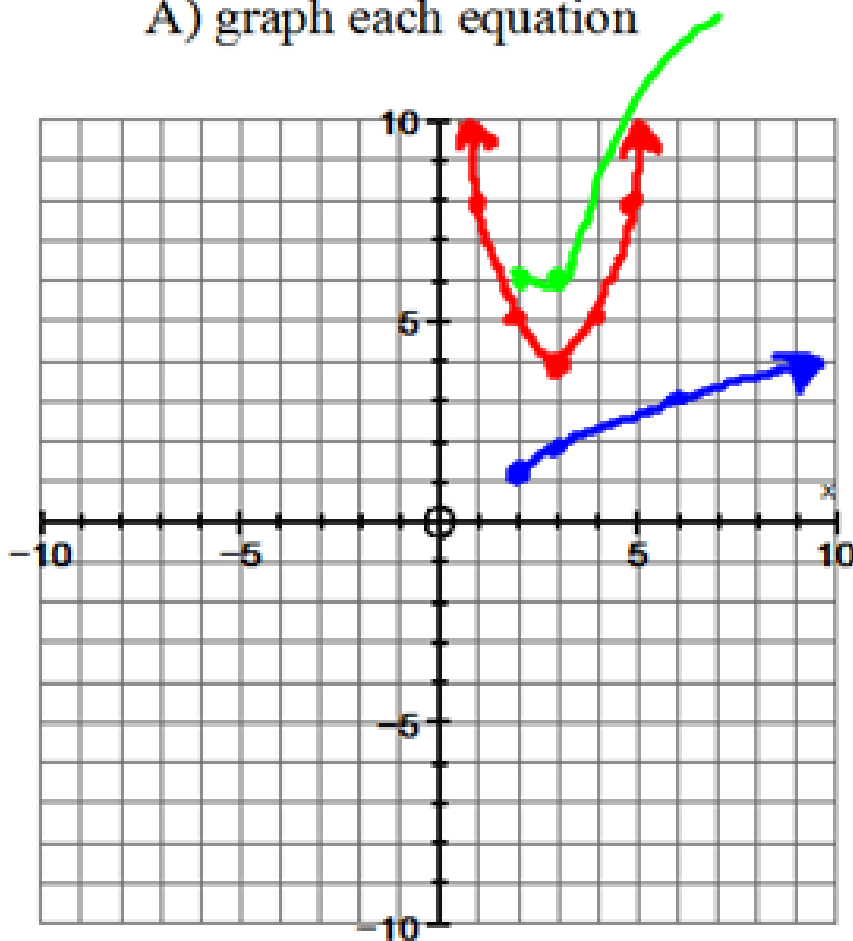
When adding and subtracting functions, you can only add the y values from each function if they have the same x value.

$f(x)$ quadratic
vertex $(3, 4)$
opens up

Example: Consider $f(x) = (x-3)^2 + 4$ and $g(x) = \sqrt{x-2} + 1$

↳ radical endpt $(2, 1)$

A) graph each equation



B) give the domain of each equation

$$f(x): \{x | x \in \mathbb{R}\}$$

$$g(x): \{x | x \geq 2\}$$

C) give the domain of $(f+g)(x)$:

$$p(x) = (f+g)(x) = f(x) + g(x)$$

$$\{x | x \geq 2\}$$

10.2

multiply

HW: pg 496 #1,2,3,6,7,9

Products and Quotients of Functions

Divide

Focus on...

- sketching the graph of a function that is the product or quotient of two functions
- determining the domain and range of a function that is the product or quotient of two functions
- writing the equation of a function that is the product or quotient of two functions

The product of functions:

$$\begin{aligned}h(x) &= f(x)g(x) \\ &= (x+2)(x+3)\end{aligned}$$

Big Dot
↓
closed circle

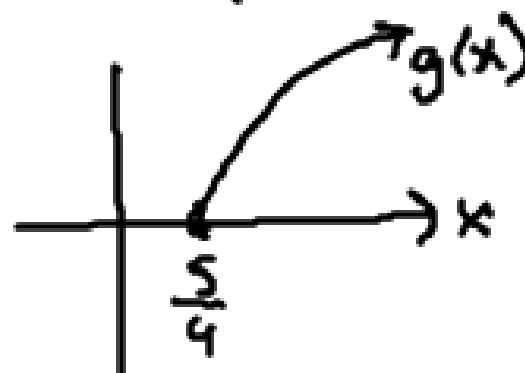
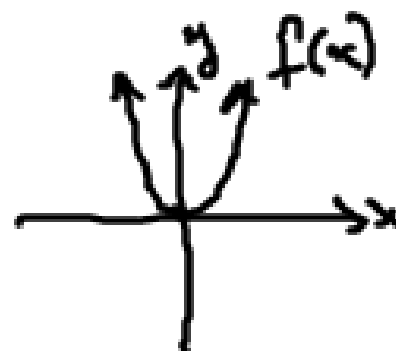
$$h(x) = (f \cdot g)(x)$$

Pg. 491

Your Turn

Given $f(x) = x^2$ and $g(x) = \sqrt{4x - 5}$, determine $h(x) = f(x)g(x)$. State the domain and range of $h(x)$.

function	Domain	Range
$f(x) = x^2$	$\{x \mid x \in \mathbb{R}\}$	$\{y \mid y \geq 0\}$
$g(x) = \sqrt{4x - 5}$	$4x - 5 \geq 0$ $4x \geq 5$ $x \geq \frac{5}{4}$ $\{x \mid x \geq \frac{5}{4}\}$	$\{y \mid y \geq 0\}$
$h(x) = x^2 \sqrt{4x - 5}$	$\{x \mid x \geq \frac{5}{4}\}$	$\{y \mid y \geq 0\}$



The quotient of functions:

$$h(x) = \frac{f(x)}{g(x)} \qquad h(x) = \left(\frac{f}{g} \right)(x)$$

The domain of a quotient of functions is restricted for values of x where $g(x) = 0$.

$$h(x) = \frac{x+2}{x-3} \leftarrow \text{VA}$$

or

$$h(x) = \frac{x^2 + 5x + 6}{x+3} = \frac{\cancel{(x+3)}(x+2)}{\cancel{x+3}} \leftarrow \text{hole (POD)}$$

Your Turn

Let $f(x) = x + 2$ and $g(x) = x^2 + 9x + 14$.

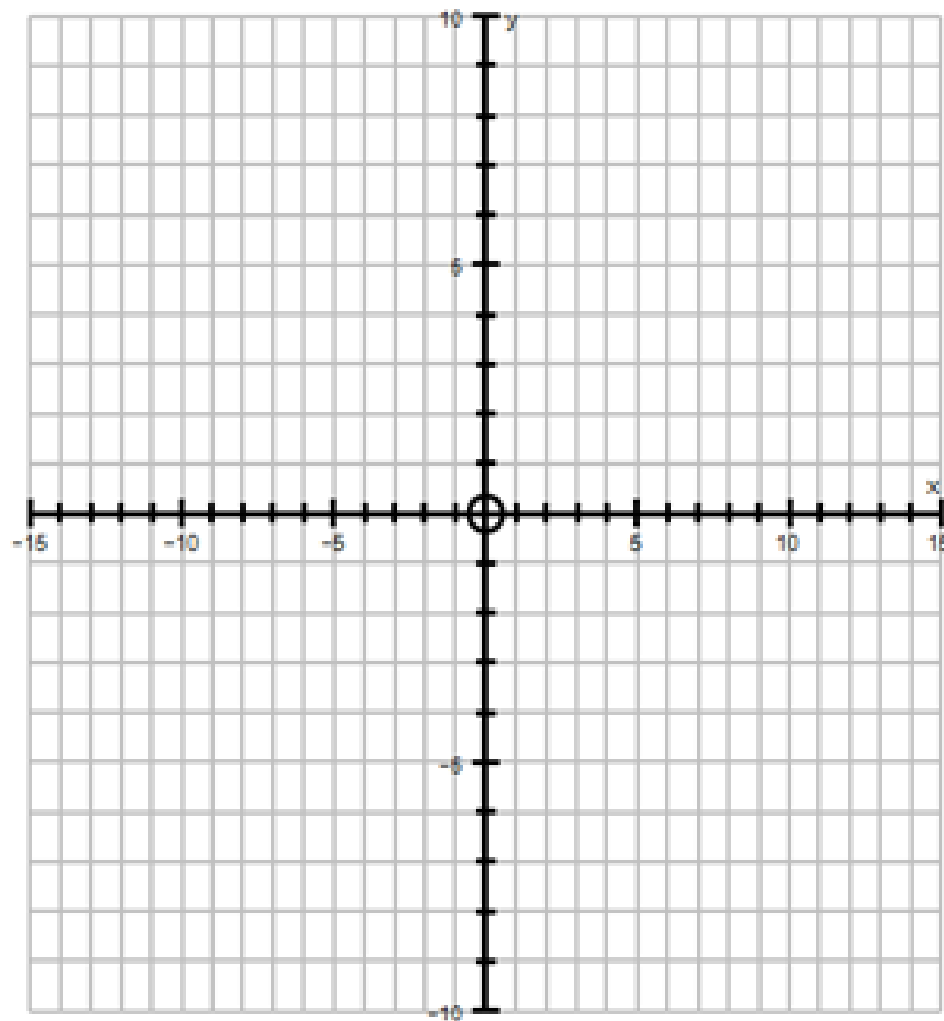
- Determine the equation of the function $h(x) = \left(\frac{f}{g}\right)(x)$.
- Sketch the graphs of $f(x)$, $g(x)$, and $h(x)$ on the same set of coordinate axes.
- State the domain and range of $h(x)$.

$$f(x) = x + 2 \leftarrow \text{linear}$$

$$g(x) = x^2 + 9x + 14 \leftarrow \text{Quad}$$

$$h(x) = \frac{x+2}{x^2+9x+14} = \frac{\cancel{x+2}}{(\cancel{x+2})(x+7)}$$

$$\text{POD at } x = \underline{-2} \quad y = \frac{1}{5}$$



function

D

Range

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

$$g(x) = x^2 + 9x + 14$$

vertex $x = -\frac{b}{2a}$
 $= -\frac{9}{2(1)} = -\frac{9}{2}$

$$h(x) = \frac{1}{x+7}$$

$$\{x \in \mathbb{R}\}$$

$$\{x \mid x \in \mathbb{R}\}$$

$$g\left(-\frac{9}{2}\right) = -6.25$$

$$\{x \mid x \neq -7, -2\}$$

VA POD

$$\{y \mid y \in \mathbb{R}\}$$

$$\{y \mid y \geq -6.25\}$$

$$\{y \mid y \neq 0, \frac{1}{5}\}$$

HA
POD

