

For each of the following,

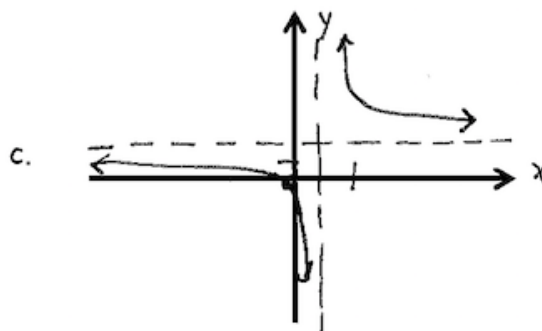
Alg2 HW 6.3

- State the type of trouble.
- Find the domain algebraically.
- Sketch the graph.
- Use the graph to find the range.

1. $y = \frac{4x}{2x-1}$

a. var in denominator
 $2x-1 \neq 0$

b. $\{x | x \neq \frac{1}{2}\}$

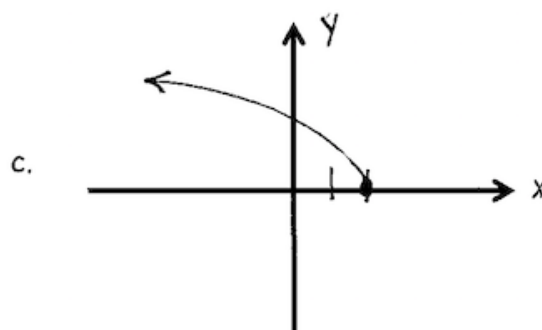


d. $\{y | y \neq 2\}$

2. $y = \sqrt{8-4x}$

a. variable under $\sqrt{\quad}$
 $8-4x \geq 0$
 $-4x \geq -8$

b. $\{x | x \leq 2\}$

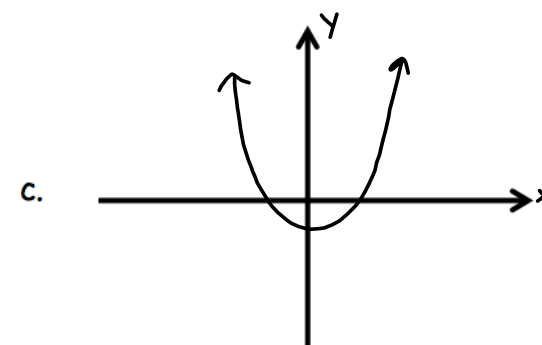


d. $\{y | y \geq 0\}$

3. $y = 2x^2 - 1$

a. no trouble

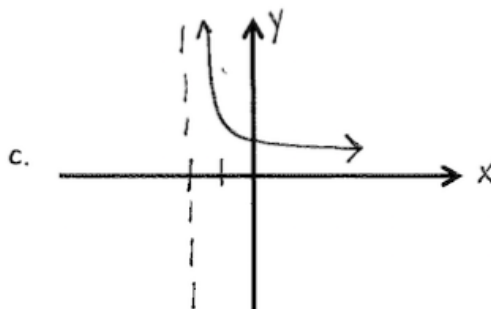
b. $\{x | x \in \mathbb{R}\}$



d. $\{y | y \geq -1\}$

4. $y = \frac{5}{\sqrt{2x+4}}$

a. double trouble
var under $\sqrt{\quad}$ in denom
 $2x+4 > 0$
 $2x > -4$

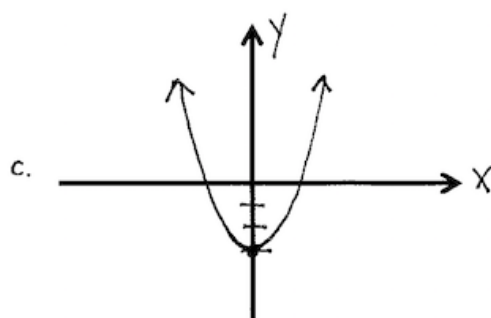


b. $\{x | x > -2\}$

d. $\{y | y > 0\}$

5. $y = x^2 - 3$

a. no trouble



b. $\{x | x \in \mathbb{R}\}$

d. $\{y | y \geq -3\}$

6. State the domain and range for the function below. Determine the intervals on which the graph is increasing and decreasing. Find all relative minima and maxima.

Domain: $\{x | x \in \mathbb{R}\}$ $(-\infty, \infty)$

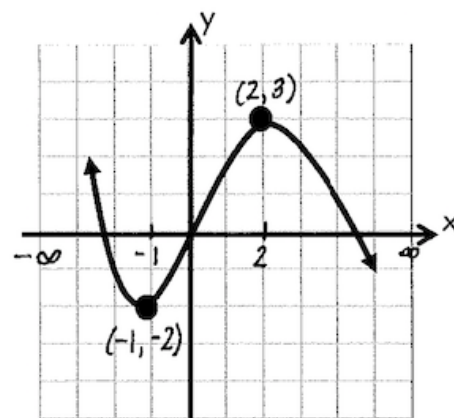
Range: $\{y | y \in \mathbb{R}\}$ $(-\infty, \infty)$

Increasing: $(-1, 2)$

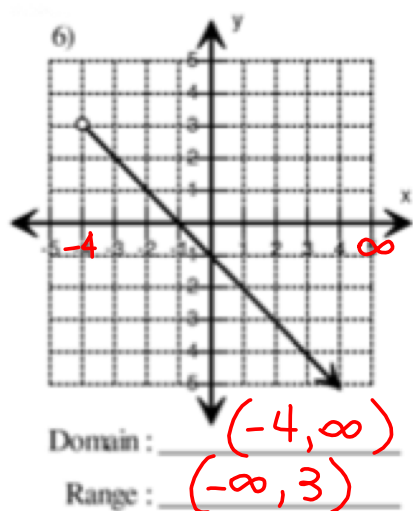
Decreasing: $(-\infty, -1)$, $(2, \infty)$

Relative Min: $(-1, -2)$

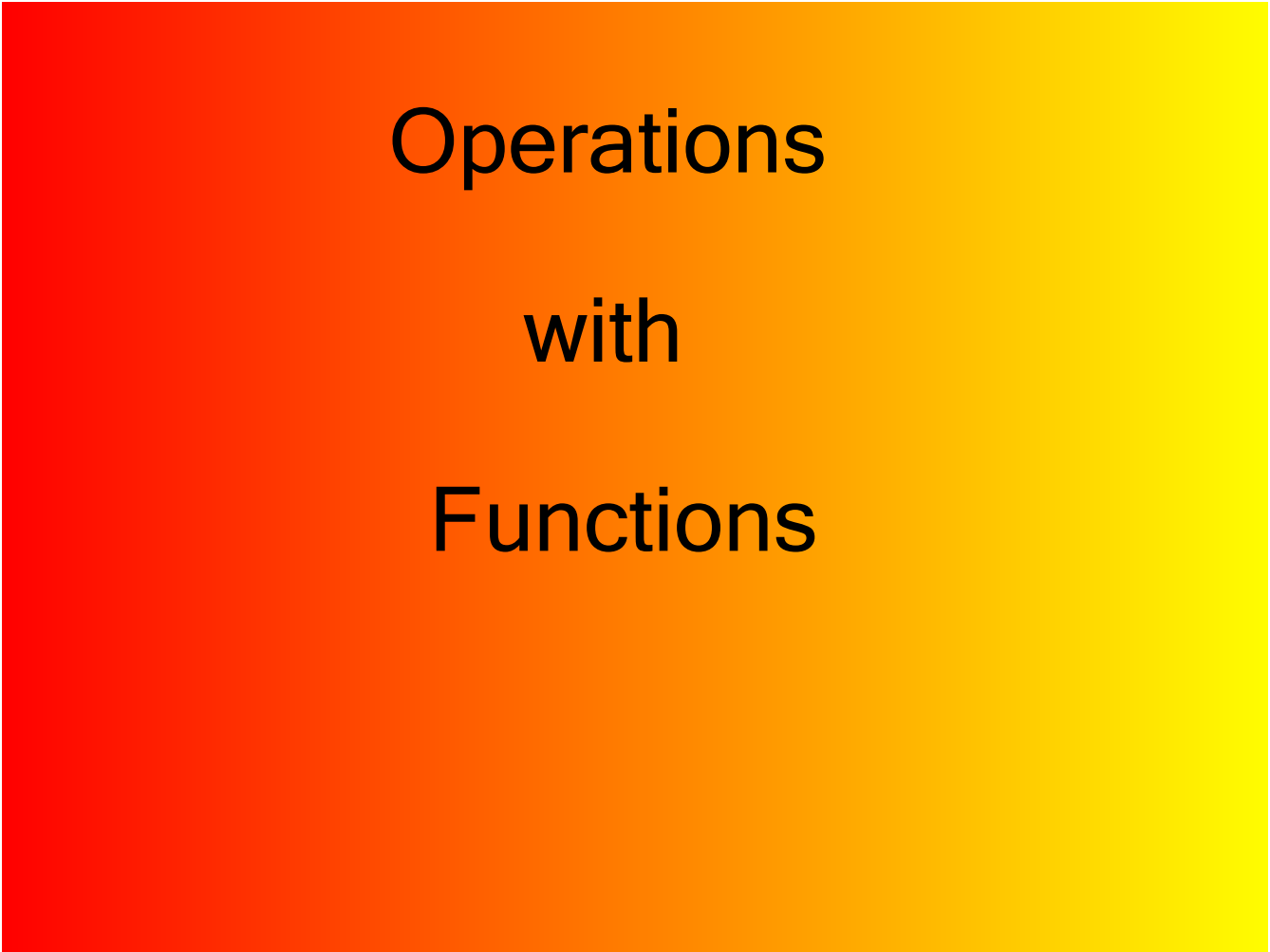
Relative Max: $(2, 3)$



Warm-Up: Find the domain and range and the average rate of change for number 6 on the warm-up sheet.



Slope
 $-1 = \text{avg rate of change}$



Operations with Functions

Rules

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

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

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

$$\left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)}, \text{ where } g(x) \neq 0$$

Domains: consist of x-values that are in the domain of BOTH f and g .

Let $f(x) = 2x + 3$ and $g(x) = \sqrt{x} + x$, find the following:

1. $(f + g)(4) = f(4) + g(4)$

$$f(4) = 2(4) + 3 = 11$$

$$g(4) = \sqrt{4} + 4 = 6$$

$$f(4) + g(4) = 11 + 6 = 17$$

3. $(f + g)(x) = f(x) + g(x)$

$$2x + 3 + \sqrt{x} + x$$

$$3x + \sqrt{x} + 3$$

← var. under Rad

Domain: $\{x | x \geq 0\}$

2. $(f - g)(1) = f(1) - g(1)$

$$f(1) = 2(1) + 3 = 5$$

$$g(1) = \sqrt{1} + 1 = 2$$

$$f(1) - g(1) = 5 - 2 = 3$$

4. $(f - g)(x) = f(x) - g(x)$

$$(2x + 3) - (\sqrt{x} + x)$$

$$2x + 3 - \sqrt{x} - x$$

$$x - \sqrt{x} + 3$$

Domain: $\{x | x \geq 0\}$

Let $f(x) = x^2 - 4$ and $g(x) = x - 2$, find the following:

$$\begin{aligned}
 5. \quad (f \cdot g)(-1) &= f(-1) \cdot g(-1) \\
 f(-1) &= (-1)^2 - 4 = -3 \\
 g(-1) &= -1 - 2 = -3 \\
 (-3) \cdot (-3) &= 9
 \end{aligned}$$

$$\begin{aligned}
 7. \quad (f \cdot g)(x) &= f(x) \cdot g(x) \\
 &= (x^2 - 4)(x - 2) \\
 &= x^3 - 2x^2 - 4x + 8
 \end{aligned}$$

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

$$\begin{aligned}
 6. \quad \left(\frac{f}{g}\right)(4) &= \frac{f(4)}{g(4)} = \frac{12}{2} = 6 \\
 f(4) &= 4^2 - 4 = 12 \\
 g(4) &= 4 - 2 = 2
 \end{aligned}$$

$$\begin{aligned}
 8. \quad \left(\frac{f}{g}\right)(x) &= \frac{f(x)}{g(x)} = \frac{x^2 - 4}{x - 2} = \frac{(x-2)(x+2)}{x-2} \\
 &= x+2 \quad x \neq 2
 \end{aligned}$$

Domain: $\{x \mid x \neq 2\}$

Let $f(x) = 3x^2 - 11x - 4$ and $g(x) = (3x + 1)$, find each of the following:

9. $g(2n - 1)$

$$\begin{aligned} &3(2n - 1) + 1 \\ &6n - 3 + 1 \\ &6n - 2 \end{aligned}$$

10. $f(2n)$

$$\begin{aligned} &3(2n)^2 - 11(2n) - 4 \\ &3(4n^2) - 22n - 4 \\ &12n^2 - 22n - 4 \end{aligned}$$

$$(2n)^2 = 4n^2$$

11. $(f + g)(x) = f(x) + g(x)$

$$\begin{aligned} &3x^2 - 11x - 4 + 3x + 1 \\ &3x^2 - 8x - 3 \end{aligned}$$

12. $(f - g)(x) = f(x) - g(x)$

$$\begin{aligned} &(3x^2 - 11x - 4) - (3x + 1) \\ &3x^2 - 11x - 4 - 3x - 1 \\ &3x^2 - 14x - 5 \end{aligned}$$

Domain: $\{x | x \in \mathbb{R}\}$

Domain: $\{x | x \in \mathbb{R}\}$

Let $f(x) = 3x^2 - 11x - 4$ and $g(x) = (3x + 1)$, find each of the following:

$$13. \left(\frac{f}{g}\right)(x) = \frac{f(x)}{g(x)} = \frac{3x^2 - 11x - 4}{3x + 1}$$

$$3x + 1 \neq 0 \\ x \neq -\frac{1}{3}$$

$$= \frac{(3x + 1)(x - 4)}{3x + 1}$$

$$14. \left(\frac{g}{f}\right)(x) = \frac{3x + 1}{3x^2 - 11x - 4}$$

$$= \frac{3x + 1}{(3x + 1)(x - 4)} \quad \begin{matrix} x \neq -\frac{1}{3} \\ x \neq 4 \end{matrix}$$

$$= \frac{1}{x - 4}$$

Domain: $\{x \mid x \neq -\frac{1}{3}\}$

Domain: $\{x \mid x \neq -\frac{1}{3}, 4\}$

