WARM-UP

DIRECTIONS: Evaluate each function for all real numbers.

$\boldsymbol{f(x) = x^2 - 2x}$

$\boldsymbol{g(x) = \frac{2x+4}{x-8}}$

$\boldsymbol{h(x) = \sqrt{6x - 18}}$

$f(3) =$ _____

$g(2) =$ _____

$h(5) =$ _____

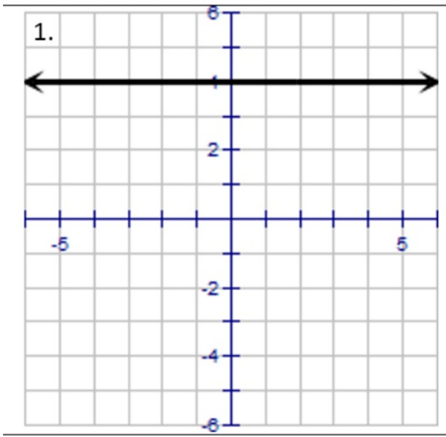
$f(-2) =$ _____

$g(8) =$ _____

$h(2) =$ _____

Section 2 Worksheet - ANSWERS

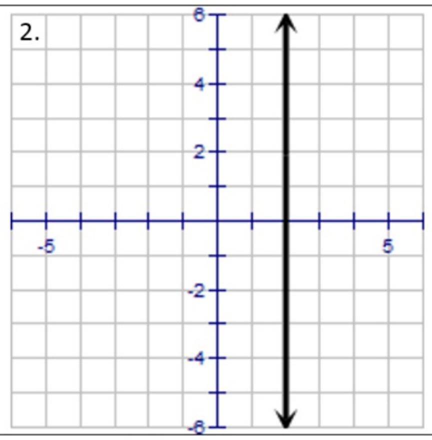
1.



DOMAIN: $(-\infty, \infty)$

RANGE: $[4]$

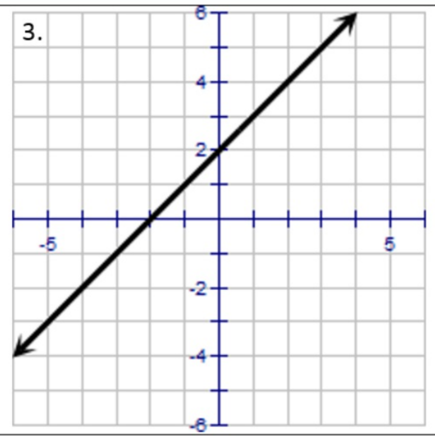
2.



DOMAIN: $[2]$

RANGE: $(-\infty, \infty)$

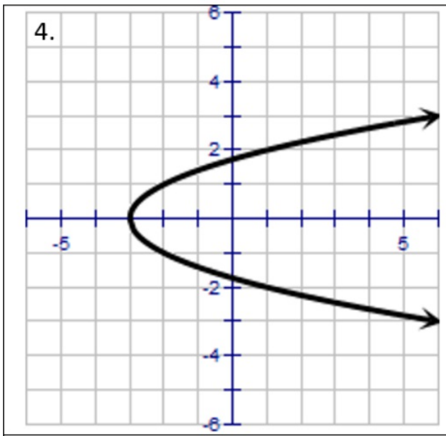
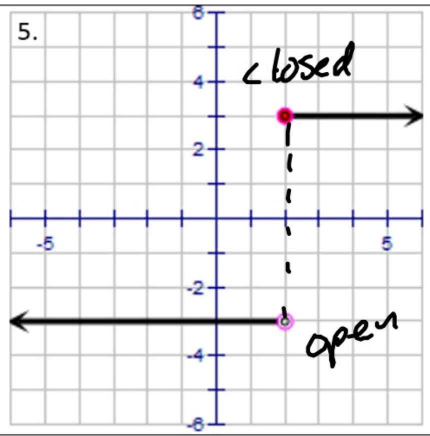
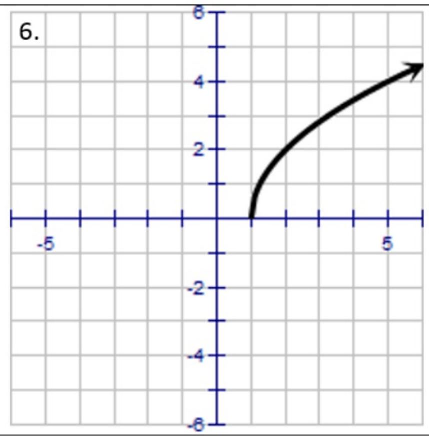
3.



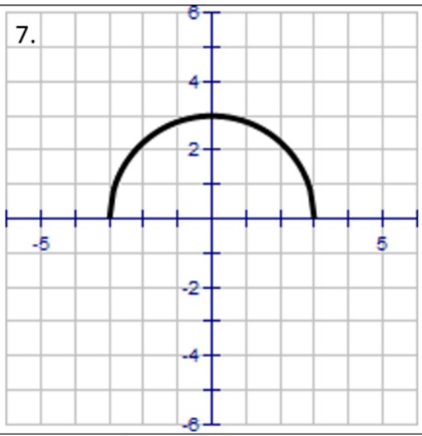
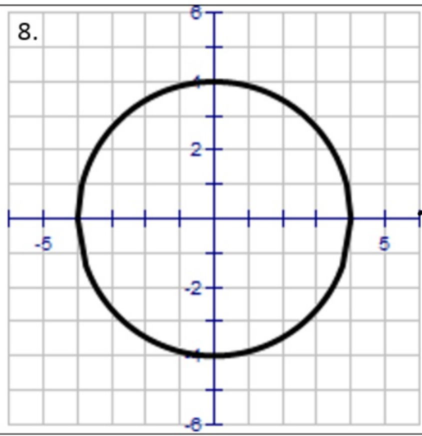
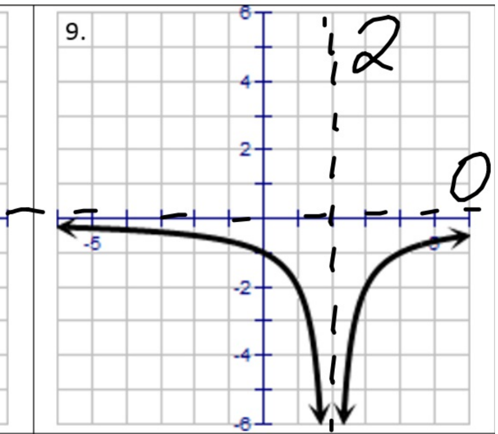
DOMAIN: $(-\infty, \infty)$

RANGE: $(-\infty, \infty)$

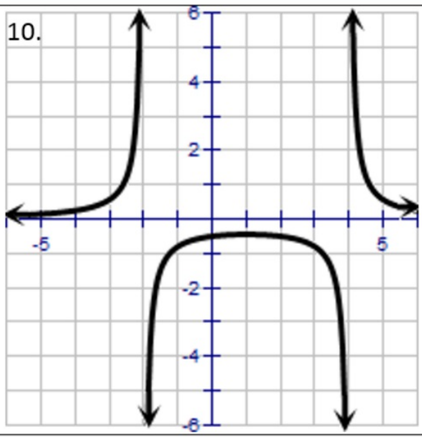
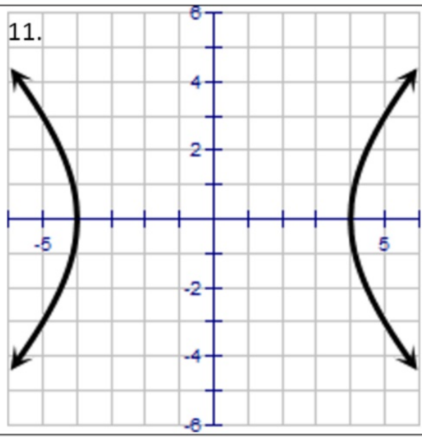
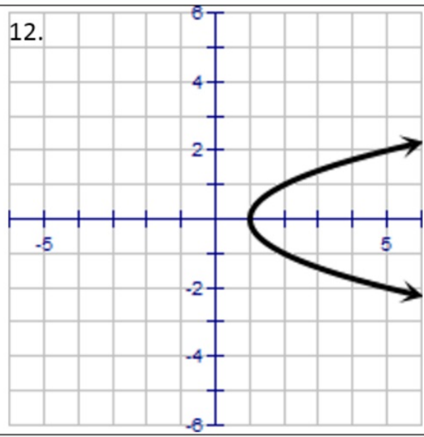
Section 2 Worksheet - ANSWERS

4. 	5. 	6. 
DOMAIN: $[-\mathbf{3}, \infty)$	DOMAIN: $(-\infty, \infty)$	DOMAIN: $[\mathbf{1}, \infty)$
RANGE: $(-\infty, \infty)$	RANGE: $[-\mathbf{3}] \cup [\mathbf{3}]$	RANGE: $[\mathbf{0}, \infty)$

Section 2 Worksheet - ANSWERS

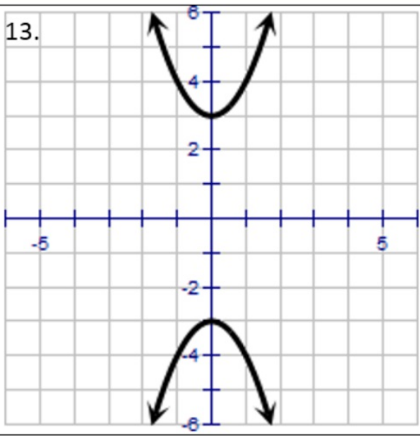
7. 	8. 	9. 
DOMAIN: $[-3, 3]$	DOMAIN: $[-4, 4]$	DOMAIN: $(-\infty, 2) \cup (2, \infty)$
RANGE: $[0, 3]$	RANGE: $[-4, 4]$	RANGE: $(-\infty, 0)$

Section 2 Worksheet - ANSWERS

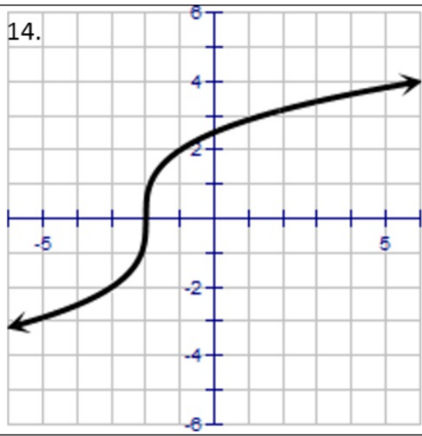
10.	11.	12.
		
DOMAIN	DOMAIN	DOMAIN
$(-\infty, -\mathbf{2}) \cup (-\mathbf{2}, \mathbf{4}) \cup (\mathbf{4}, \infty)$	$(-\infty, -\mathbf{4}] \cup [\mathbf{4}, \infty)$	$[\mathbf{1}, \infty)$
RANGE	RANGE	RANGE
$(-\infty, \mathbf{0}) \cup (\mathbf{0}, \infty)$	$(-\infty, \infty)$	$(-\infty, \infty)$

Section 2 Worksheet - ANSWERS

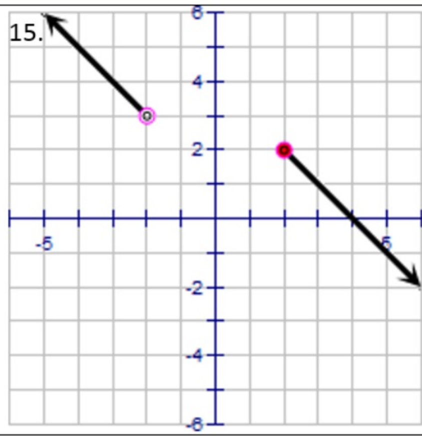
13.



14.

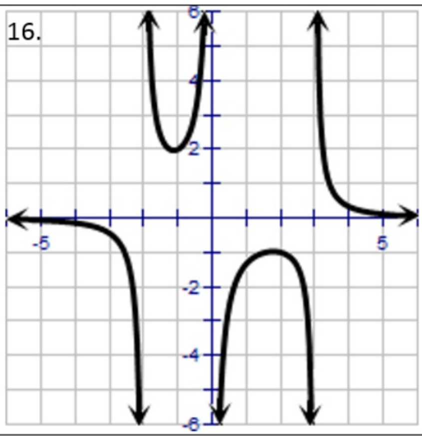
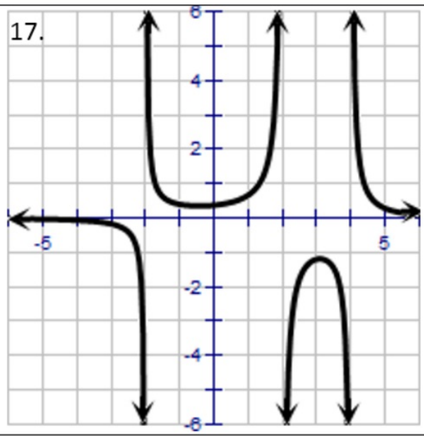
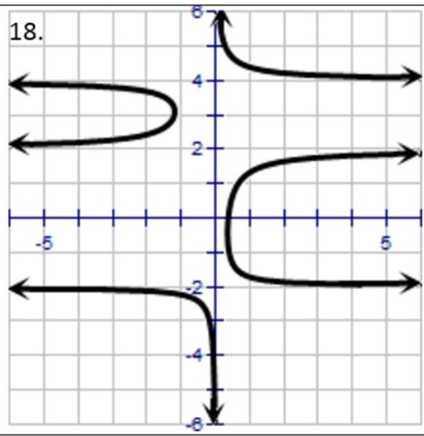


15.



13.	14.	15.
DOMAIN	DOMAIN	DOMAIN
$(-\infty, \infty)$	$(-\infty, \infty)$	$(-\infty, -\mathbf{2}) \cup [\mathbf{2}, \infty)$
RANGE	RANGE	RANGE
$(-\infty, -\mathbf{3}] \cup [\mathbf{3}, \infty)$	$(-\infty, \infty)$	$(-\infty, \mathbf{2}] \cup (\mathbf{3}, \infty)$

Section 2 Worksheet - ANSWERS

16. 	17. 	18. 
DOMAIN	DOMAIN	DOMAIN
$(-\infty, -\mathbf{2}) \cup (-\mathbf{2}, \mathbf{0}) \cup (\mathbf{0}, \mathbf{3}) \cup (\mathbf{3}, \infty)$	$(-\infty, -\mathbf{2}) \cup (-\mathbf{2}, \mathbf{2}) \cup (\mathbf{2}, \mathbf{4}) \cup (\mathbf{4}, \infty)$	$(-\infty, \mathbf{0}) \cup (\mathbf{0}, \infty)$
RANGE	RANGE	RANGE
$(-\infty, \mathbf{0}) \cup (\mathbf{0}, \infty)$	$(-\infty, \mathbf{0}) \cup (\mathbf{0}, \infty)$	$(-\infty, -\mathbf{2}) \cup (-\mathbf{2}, \mathbf{2}) \cup (\mathbf{2}, \mathbf{4}) \cup (\mathbf{4}, \infty)$

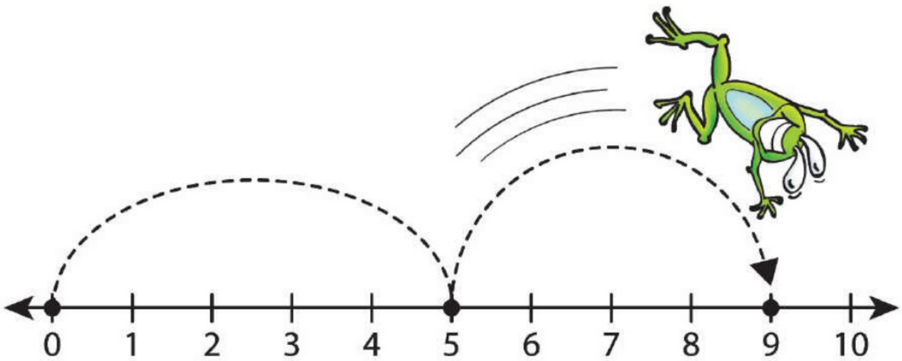
SECTION 3

Finding the Domain - Algebraically

TODAY'S LEARNING TARGETS:

- Why is it important to determine the domain of a function?
- How can the domain of a function be restricted?
- What is the connection between solving inequalities and interval notation?

FINDING DOMAIN ALGEBRAICALLY



When dealing with real numbers (numbers on a number line), what are two things in mathematics that we are NOT allowed to do?

FINDING DOMAIN ALGEBRAICALLY

WE CANNOT

DIVIDE BY ZERO

WE CANNOT

TAKE THE SQUARE ROOT OF A NEGATIVE NUMBER

THREE CASES WHEN THE DOMAIN IS RESTRICTED

- Below are three cases where restrictions are placed on possible x-values.
- Remember, **MOST** of the time the domain of a function is all real numbers **EXCEPT** for the following cases:

CASE 1: Fractions

CASE 2: Radicals

CASE 3: Fraction / Radical Combination

CASE 1: Fractions

- Because we cannot divide by __**ZERO**__, we need to find out what values will cause the denominator to equal __**ZERO**__
- To do this we will set the denominator equal to __**ZERO**__ and solve for the variable.

$$f(x) = \frac{1}{x - 5}$$

EXAMPLE 1 Finding Domain - CASE #1

$$f(x) = \frac{x - 1}{x^2 - 3x - 108}$$

$x^2 - 3x - 108 = 0$

$(x-12)(x+9) = 0$

$x - 12 = 0$
$+12 \ +12$
$x = 12$

$x + 9 = 0$
$-9 \ -9$
$x = -9$

$x \neq \{-9, 12\}$

DOMAIN: $(-\infty, -9) \cup (-9, 12) \cup (12, \infty)$

EXAMPLE 2 Finding Domain - CASE #1

$$f(x) = \frac{x+5}{x^2 - 3x - 28}$$

$x^2 - 3x - 28 = 0$

$(x-7)(x+4) = 0$

$x - 7 = 0 \qquad x + 4 = 0$

$\quad +7 \; +7 \qquad -4 \; -4$

$x = 7 \qquad x = -4$

DOMAIN: $(-\infty, -4) \cup (-4, 7) \cup (7, \infty)$

EXAMPLE 3 Finding Domain - CASE #1

$$f(x) = \frac{3x - 1}{9x^2 - 6x + 1}$$

DOMAIN: ______________________________

EXAMPLE 4 Finding Domain - CASE #1

$$f(x) = \frac{6x^2 - x - 12}{2x^2 - 5x + 3}$$

DOMAIN: ________________________________

EXAMPLE 5 Finding Domain - CASE #1

$$f(x) = \frac{x^2}{x^2 + 5}$$

DOMAIN: ______________________________

CASE #2: Radicals

- We cannot take the square root of a ___________ number.

- To find the domain, we must set the expression under the radical _____ 0.

- If there is an x^2 term under the radical, make sure to use the ______________________.

$$f(x) = \sqrt{2x - 6}$$

EXAMPLE 6 Finding Domain - CASE #2

$f(x) = \sqrt{2x - 6}$

DOMAIN: ______________________________

EXAMPLE 7 Finding Domain - CASE #2

$$f(x) = \sqrt{12 - 3x}$$

DOMAIN: ______________________________

EXAMPLE 8 Finding Domain - CASE #2

$f(x) = \sqrt{x^2 - 4}$

DOMAIN: ________________________________

EXAMPLE 9 Finding Domain - CASE #2

$$f(x) = \sqrt{9 - x^2}$$

DOMAIN: ______________________________

EXAMPLE 10 Finding Domain - CASE #2

$$f(x) = \sqrt{x^2 - 5x + 4}$$

DOMAIN: ________________________________

POLL 1 State the domain in interval notation.

$$f(x) = \frac{x+2}{x^2+3x-10}$$

a.) (-∞, -5)U(-5, 2)U(2, ∞)

b.) (-∞, -2)U(-2, 5)U(5, ∞)

c.) (-∞, -5)U(2, ∞)

d.) (-∞, -2)U(5, ∞)

POLL 2 State the domain in interval notation.

$g(x) = \sqrt{8x + 32}$

a.) (-∞, -4)U(-4, ∞)

b.) (-∞, -4]

c.) [-4, ∞)

d.) (-4, ∞)

POLL 3 State the domain in interval notation.

$$h(x) = \frac{x+2}{x^2 - 3x}$$

a.) (-∞, -3)U(-3, 0)U(0, ∞)

b.) (-∞, 0)U(0, 3)U(3, ∞)

c.) (-∞, -3)U(0, ∞)

d.) (-∞, 0)U(3, ∞)

POLL 4 State the domain in interval notation.

$j(x) = \sqrt{28 - 7x}$

a.) (-∞, 4)U(4, ∞)

b.) (-∞, 4]

c.) [4, ∞)

d.) (4, ∞)

SELF CHECK

REVIEW OF TODAY'S LEARNING TARGETS:

- ☑ Why is it important to determine the domain of a function?
- ☑ How can the domain of a function be restricted?
- ☑ What is the connection between solving inequalities and interval notation?

WARM-UP

DIRECTIONS: State the domain in interval notation.

1.) $f(x) = \dfrac{2x+6}{x-3}$

2.) $g(x) = \dfrac{x+2}{x^2+4x-21}$

3.) $h(x) = \dfrac{x-3}{x^2-25}$

4.) $j(x) = \dfrac{x+2}{3x^2+9x}$

Section 3 Worksheet - ANSWERS

1.) $(-\infty, \mathbf{0}) \cup (\mathbf{0}, \infty)$

2.) $(-\infty, \mathbf{2}\ ) \cup (\mathbf{2}, \infty)$

3.) $(-\infty, -\mathbf{3}) \cup (-\mathbf{3}, \infty)$

4.) $(-\infty, -\mathbf{8}) \cup (-\mathbf{8}, \mathbf{12}) \cup (\mathbf{12}, \infty)$

5.) $(-\infty, -\mathbf{4}) \cup (-\mathbf{4}, -\mathbf{3}) \cup (-\mathbf{3}, \infty)$

6.) $\left(-\infty, -\frac{\mathbf{1}}{\mathbf{2}}\right) \cup \left(-\frac{\mathbf{1}}{\mathbf{2}}, \mathbf{3}\right) \cup (\mathbf{3}, \infty)$

Section 3 Worksheet - ANSWERS

7.) $[\mathbf{3}, \infty)$

8.) $[-\mathbf{4}, \infty)$

9.) $(-\infty, -\mathbf{3}] \cup [\mathbf{3}, \infty)$

10.) $(-\infty, \infty)$

11.) $[-\mathbf{2}, \mathbf{2}]$

12.) $(-\infty, -\mathbf{4}] \cup [\mathbf{3}, \infty)$

RECALL 3 CASES WHEN DOMAIN IS RESTRICTED

- Below are three cases where restrictions are placed on possible x-values.
- Remember, **MOST** of the time the domain of a function is all real numbers **EXCEPT** for the following cases:

CASE 1:

CASE 2:

CASE 3:

CASE #3: Fractions / Radicals Combination

PART 1: ***Radical is in the denominator of the fraction***

- Denominator cannot be ___________________.

- Expression under the radical cannot be ____________.

- Therefore; to find the domain, we must set the expression under the radical ______ 0.

$$f(x) = \frac{5}{\sqrt{2x - 10}}$$

CASE #3: Fractions / Radicals Combination

PART 2: ***Radical is in the numerator of the fraction***

- Set the denominator equal to ___ , then solve for x.
- Set the expression under the radical ___ 0, then solve for x.
- Compare both answers on a ________________ to determine the domain of the function.

$$f(x) = \frac{\sqrt{x^2 - 36}}{2x - 8}$$

EXAMPLE 11 Finding Domain - CASE #3

$$f(x) = \frac{5}{\sqrt{2x - 10}}$$

DOMAIN: ______________________________

EXAMPLE 12 Finding Domain - CASE #3

$$f(x) = \frac{9}{\sqrt{x^2 - 144}}$$

DOMAIN: ______________________________

EXAMPLE 13 Finding Domain - CASE #3

$$f(x) = \frac{11}{\sqrt{x^2 - 100}}$$

DOMAIN: ______________________________

EXAMPLE 14 Finding Domain - CASE #3

$$f(x) = \frac{\sqrt{x^2 - 36}}{2x - 8}$$

DOMAIN: ________________________________

EXAMPLE 15 Finding Domain - CASE #3

$$f(x) = \frac{\sqrt{x^2 - 25}}{3x - 24}$$

DOMAIN: ______________________________

EXAMPLE 16 Finding Domain - CASE #3

$$f(x) = \frac{\sqrt{9 - x^2}}{x^2 + 7x + 10}$$

DOMAIN: ______________________________

GUIDED PRACTICE

DIRECTIONS: State the domain in interval notation.

$$f(x) = \sqrt{25 - 4x^2}$$

$$g(x) = \sqrt[4]{x^2 - \frac{1}{4}}$$

$$h(x) = \sqrt[3]{x^2 - 12}$$

GUIDED PRACTICE

DIRECTIONS: State the domain in interval notation.

$$j(x) = \frac{x+5}{\sqrt{2x^2 - 72}}$$

$$p(x) = \frac{\sqrt{4x+8}}{x-7}$$

SELF CHECK

REVIEW OF TODAY'S LEARNING TARGETS:

- ☑ Why is it important to determine the domain of a function?
- ☑ How can the domain of a function be restricted?
- ☑ What is the connection between solving inequalities and interval notation?