1-1 Applied Calculus Solutions

Thursday, May 12, 2016 2:18 PM

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1.1 Exercises

1. The amount of garbage, G, produced by a city with population p is given by $G = f(p)$. G is measured in tons per week, and p is measured in thousands of people.
   a. The town of Tola has a population of 40,000 and produces 13 tons of garbage each week. Express this information in terms of the function f.
   b. Explain the meaning of the statement $f(5) = 2$.

(1a) $f(40) = 13$

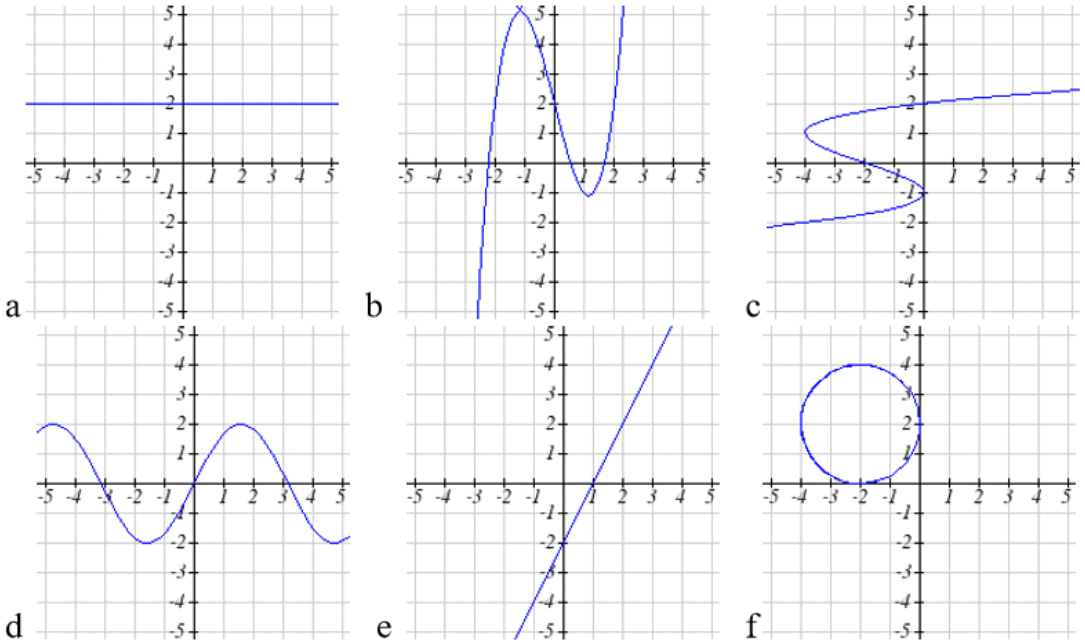
(1b) When the town of Tola has a population of 5,000, it produces 2 tons of garbage.

2. The number of cubic yards of dirt, D, needed to cover a garden with area a square feet is given by $D = g(a)$.
   a. A garden with area 5000 ft^2 requires 50 cubic yards of dirt. Express this information in terms of the function g.
   b. Explain the meaning of the statement $g(100) = 1$.

(2a) $g(5000) = 50$

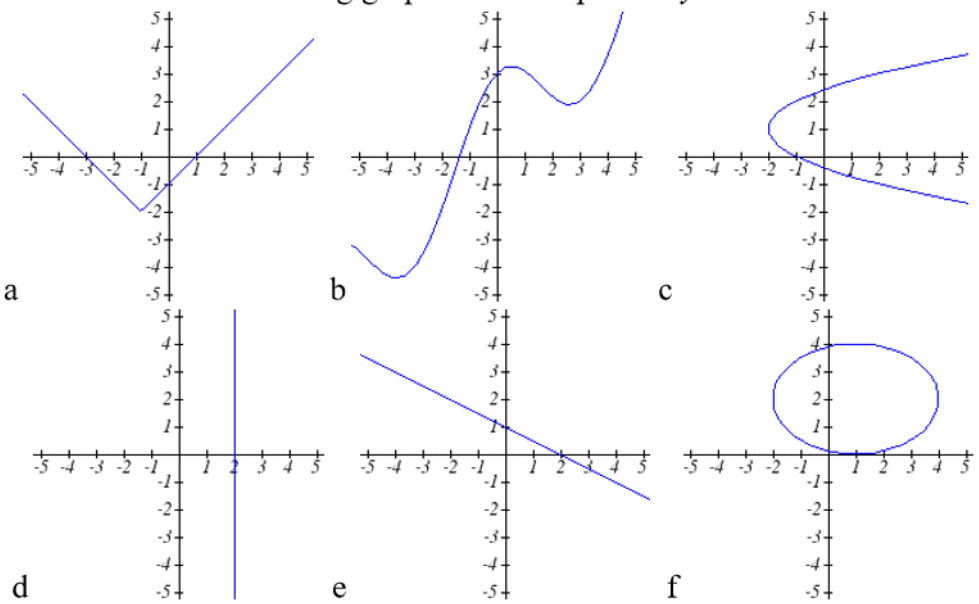
(2b) If the garden has an area of 100 square feet, then 1 cubic yard of dirt is needed to cover it.

3. Select all of the following graphs which represent y as a function of x.



The graphs of a, b, d, and e represent y as a function of x.
The graphs of c and f fail the vertical line test.

4. Select all of the following graphs which represent y as a function of x.



The graphs of a, b, and f represent y as a function of x.
The graphs of c, d, and f **fail** the vertical line test.

5. Select all of the following tables which represent y as a function of x.

a.

x	5	10	15
y	3	8	14

b.

x	5	10	15
y	3	8	8

c.

x	5	10	10
y	3	8	14

Tables a and b represent y as a function of x, because for each value of x, there is a unique corresponding value of y.

Table c does **not** represent y as a function of x, because when x = 10, there are two distinct
corresponding values of y: y = 8 and y = 14.

6. Select all of the following tables which represent y as a function of x.

a.

x	2	6	13
y	3	10	10

b.

x	2	6	6
y	3	10	14

c.

x	2	6	13
y	3	10	14

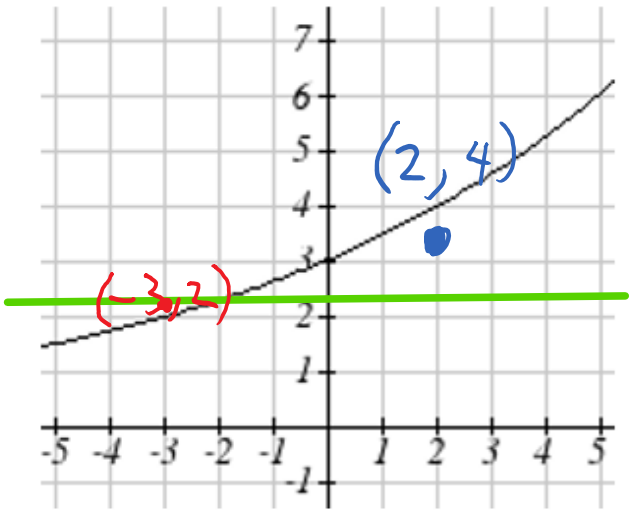
Tables a and c represent y as a function of x, because for each value of x, there is a unique corresponding value of y.

Table b does **not** represent y as a function of x, because when x = 6, there are two distinct
corresponding values of y: y = 10 and y = 14.

7. Given the function $g(x)$ graphed here,

a. Evaluate $g(2)$

b. Solve $g(x) = 2$



(7a) $g(2) = 4$

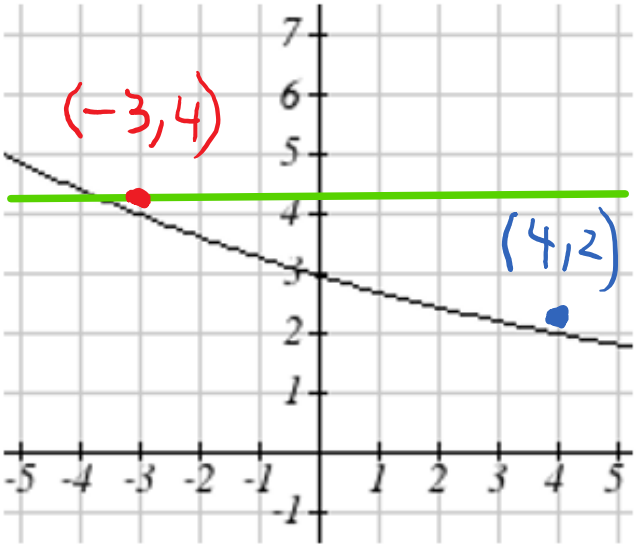
(7b) $g(x) = 2 \Rightarrow x = -3$

Draw the horizontal line y = 2 and find its intersection with the curve g(x).

8. Given the function $f(x)$ graphed here.

a. Evaluate $f(4)$

b. Solve $f(x)=4$



(8a) $f(4) = 2$

(8b) $f(x) = 4 \Rightarrow x = -3$

Draw the horizontal line y = 4 and find its intersection with the curve f(x).

9. Based on the table below,

a. Evaluate $f(3)$ b. Solve $f(x)=1$

x	0	1	2	3	4	5	6	7	8	9
$f(x)$	74	28	1	53	56	3	36	45	14	47

(9a) $f(3) = 53$

(9b) $f(x) = 1 \Rightarrow x = 2$

10. Based on the table below,

a. Evaluate $f(8)$ b. Solve $f(x)=7$

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x	0	1	2	3	4	5	6	7	8	9
$f(x)$	62	8	7	38	86	73	70	39	75	34

(10a) $f(8) = 75$

(10b) $f(x) = 7 \Rightarrow x = 2$

For each of the following functions, evaluate: $f(-2)$, $f(-1)$, $f(0)$, $f(1)$, and $f(2)$

11. $f(x) = 4 - 2x$

$f(-2) = 4 - 2(-2) = 4 + 4 = 8$

$f(-1) = 4 - 2(-1) = 4 + 2 = 6$

$f(0) = 4 - 2(0) = 4 - 0 = 4$

$f(1) = 4 - 2(1) = 4 - 2 = 2$

$f(2) = 4 - 2(2) = 4 - 4 = 0$

12. $f(x) = 8 - 3x$

$f(-2) = 8 - 3(-2) = 8 + 6 = 14$

$f(-1) = 8 - 3(-1) = 8 + 3 = 11$

$f(0) = 8 - 3(0) = 8 - 0 = 8$

$f(1) = 8 - 3(1) = 8 - 3 = 5$

$f(2) = 8 - 3(2) = 8 - 6 = 2$

13. $f(x) = 8x^2 - 7x + 3$

$f(-2) = 8(-2)^2 - 7(-2) + 3 = 32 + 14 + 3 = 49$

$f(-1) = 8(-1)^2 - 7(-1) + 3 = 8 + 7 + 3 = 18$

$f(0) = 8(0)^2 - 7(0) + 3 = 0 - 0 + 3 = 3$

$f(1) = 8(1)^2 - 7(1) + 3 = 8 - 7 + 3 = 4$

$f(2) = 8(2)^2 - 7(2) + 3 = 32 - 14 + 3 = 22$

21

14. $f(x) = 6x^2 - 7x + 4$

$f(-2) = 6(-2)^2 - 7(-2) + 4 = 24 + 14 + 4 = 42$

$f(-1) = 6(-1)^2 - 7(-1) + 4 = 6 + 7 + 4 = 17$

$f(0) = 6(0)^2 - 7(0) + 4 = 0 - 0 + 4 = 4$

$f(1) = 6(1)^2 - 7(1) + 4 = 6 - 7 + 4 = 3$

$f(2) = 6(2)^2 - 7(2) + 4 = 24 - 14 + 4 = 14$

15. $f(x) = 3 + \sqrt{x+3}$

$f(-2) = 3 + \sqrt{-2+3} = 3 + \sqrt{1} = 3 + 1 = 4$

$f(-1) = 3 + \sqrt{-1+3} = 3 + \sqrt{2}$

$f(0) = 3 + \sqrt{0+3} = 3 + \sqrt{3}$

$f(1) = 3 + \sqrt{1+3} = 3 + \sqrt{4} = 3 + 2 = 5$

$f(2) = 3 + \sqrt{2+3} = 3 + \sqrt{5}$

16. $f(x) = 4 - \sqrt[3]{x-2}$

$f(-2) = 4 - \sqrt[3]{-2-2} = 4 - \sqrt[3]{-4} = 4 + \sqrt[3]{4}$

$f(-1) = 4 - \sqrt[3]{-1-2} = 4 - \sqrt[3]{-3} = 4 + \sqrt[3]{3}$

$f(0) = 4 - \sqrt[3]{0-2} = 4 - \sqrt[3]{-2} = 4 + \sqrt[3]{2}$

$f(1) = 4 - \sqrt[3]{1-2} = 4 - \sqrt[3]{-1} = 4 + 1 = 5$

$f(2) = 4 - \sqrt[3]{2-2} = 4 - \sqrt[3]{0} = 4$

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

$f(-2)=\frac{-2-3}{-2+1}=\frac{-5}{-1}=5$

$f(-1)=\frac{-1-3}{-1+1}=\frac{-4}{0}$ not defined

$f(0)=\frac{0-3}{0+1}=\frac{-3}{1}=-3$

$f(1)=\frac{1-3}{1+1}=\frac{-2}{2}=-1$

$f(2)=\frac{2-3}{2+1}=\frac{-1}{3}=-\frac{1}{3}$

18. $f(x)=\dfrac{x-2}{x+2}$

$f(-2)=\frac{-2-2}{-2+2}=\frac{-4}{0}$ not defined

$f(-1)=\frac{-1-2}{-1+2}=\frac{-3}{1}=-3$

$f(0)=\frac{0-2}{0+2}=\frac{-2}{2}=-1$

$f(1)=\frac{1-2}{1+2}=\frac{-1}{3}=-\frac{1}{3}$

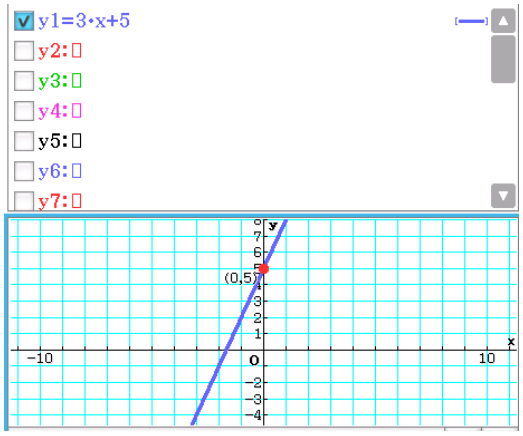
$f(2)=\frac{2-2}{2+2}=\frac{0}{4}=0$

19. Let $f(t)=3t+5$

a. Evaluate $f(0)$ b. Solve $f(t)=0$

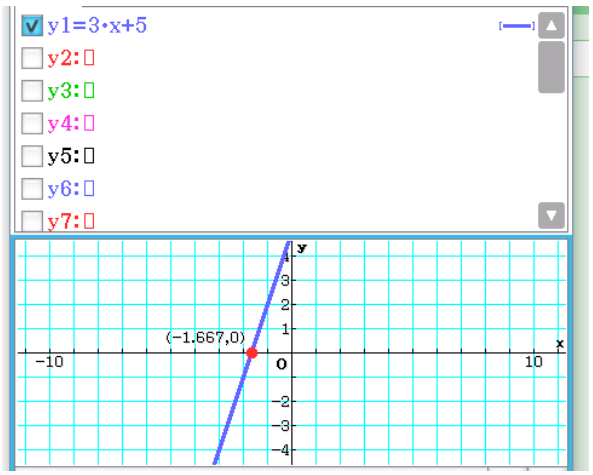
(19a) $f(0)=(3)(0)+5=0+5=5$

Casio ClassPad 400 trace



(19b) $3t + 5 = 0$
$\Leftrightarrow 3t = -5$
$\Leftrightarrow \boxed{t = \frac{-5}{3}}$

Casio ClassPad 400 root

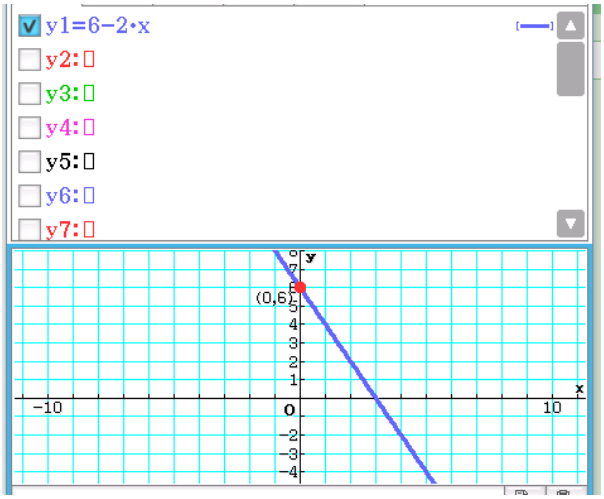


20. Let $g(p) = 6 - 2p$

a. Evaluate $g(0)$ b. Solve $g(p) = 0$

(20a) $g(0) = 6 - (2)(0) = 6 - 0 = \boxed{6}$

Casio ClassPad 400 trace



(20b)

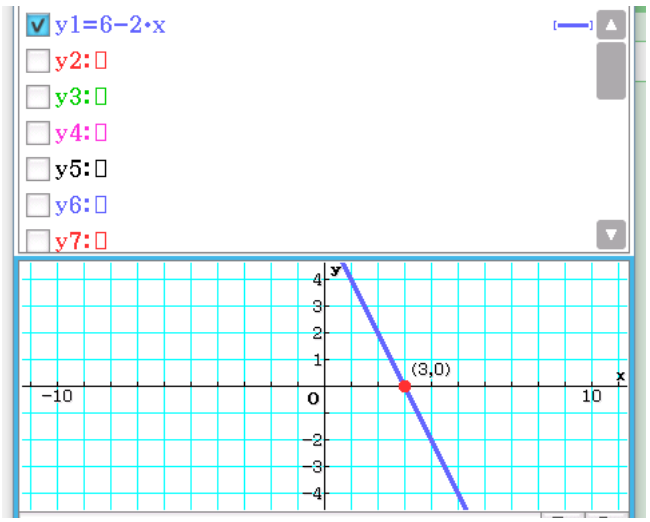
$6 - 2p = 0$

$\Leftrightarrow 2p = 6$

$\Leftrightarrow p = \frac{6}{2}$

$\Leftrightarrow \boxed{p = 3}$

ClassPad 400 root

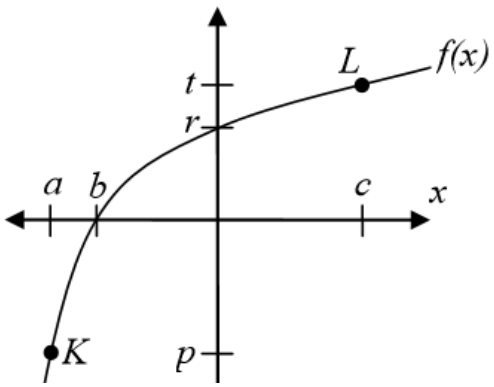


21. Using the graph shown,

a. Evaluate $f(c)$

b. Solve $f(x) = p$

c. What are the coordinates of points L and K?

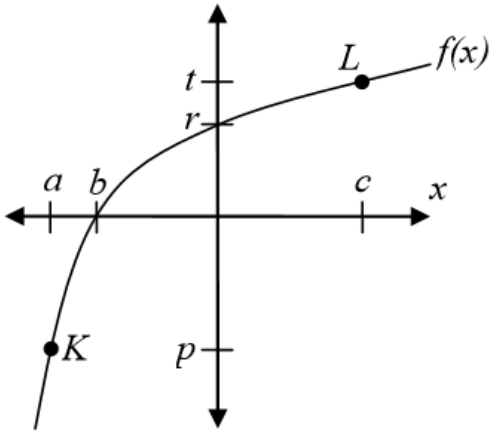


21. Using the graph shown,

a. Evaluate $f(c)$

b. Solve $f(x) = p$

c. What are the coordinates of points L and K?



(21a) $f(c) = t$

(21b) $f(x) = p \Rightarrow x = a$

(21c) coordinates of $L = (c, t)$

coordinates of $K = (a, p)$

22. Match each graph with its equation.

viii vii ii i iv vi iii v

a. $y = x$

b. $y = x^3$

c. $y = \sqrt[3]{x}$

d. $y = \frac{1}{x}$

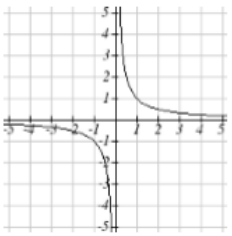
e. $y = x^2$

f. $y = \sqrt{x}$

g. $y = |x|$

h. $y = \frac{1}{x^2}$

i.



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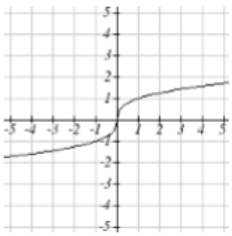

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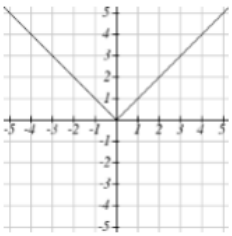

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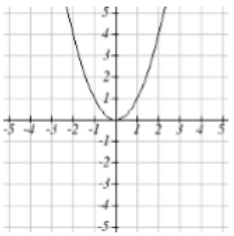

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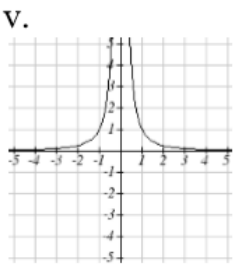

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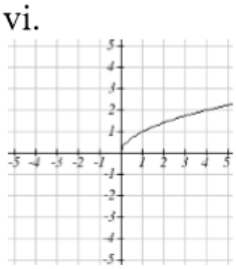

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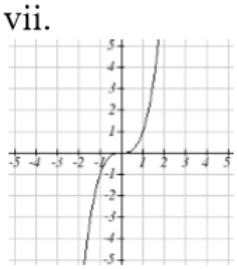

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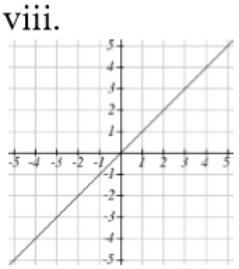
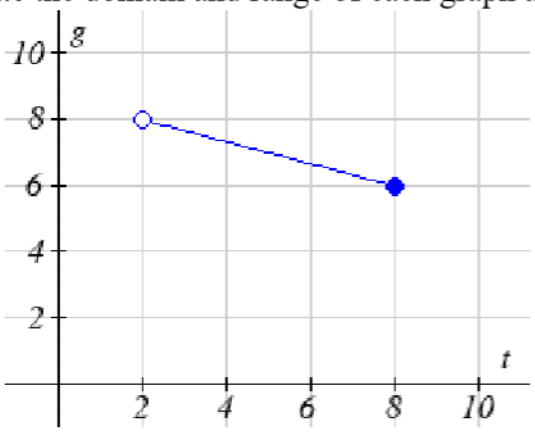


Write the domain and range of each graph as an inequality.

23.



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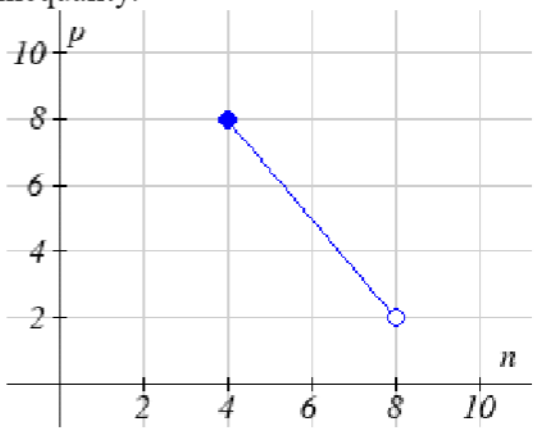

Domain = $\{x|2 < x \leq 8\}$

Range = $\{y|6 \leq y < 8\}$

Domain = $\{x|4 \leq x < 8\}$

Range = $\{y|2 < y \leq 8\}$

Find the domain of each function

25. $f(x) = 3\sqrt{x-2}$

domain of $f(x) = \{x|x - 2 \geq 0\} = \{x|x \geq 2\}$

26. $f(x) = 5\sqrt{x+3}$

domain of $f(x) = \{x|x + 3 \geq 0\} = \{x|x \geq -3\}$

27. $f(x) = \dfrac{9}{x-6}$

domain of $f(x) = \{x|x - 6 \neq 0\} = \{x|x \neq 6\}$

28. $f(x) = \dfrac{6}{x-8}$

domain of $f(x) = \{x|x - 8 \neq 0\} = \{x|x \neq 8\}$

29. $f(x)=\dfrac{3x+1}{4x+2}$

domain of $f(x)=\{x|4x+2\neq 0\}=\left\{x|x\neq -\frac{1}{2}\right\}$

30. $f(x)=\dfrac{5x+3}{4x-1}$

domain of $f(x)=\{x|4x-1\neq 0\}=\left\{x|x\neq \frac{1}{4}\right\}$

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These solutions were created by Donald R. Goral from exercises in *Applied Calculus, Edition 1* by Shana Calaway, Dale Hoffman, David Lippman