

KEY

Unit 1 Test Review

Function Notation

1. Consider the function $f(x) = 5x - 3$ and answer the following questions.

a. What is the name of the function?

$f(x)$

b. What letter represents the input? What letter represents the output?

input: x output: $f(x)$ or y

c. What rule does this function represent?

multiply by 5, subtract 3

d. Find $f(-2)$.

$$f(-2) = 5(-2) - 3 = -13$$

2. Consider the function $p(x) = 9x + 55$.

a. What is the name of the function?

$p(x)$

b. What letter represents the input? What letter represents the output?

input: x output: $p(x)$ or y

c. What rule does this function represent?

multiply by 9, add 55

d. Find $p(7)$.

$$p(7) = 9(7) + 55 = 118$$

3. Express the given rule in function notation or give a verbal description.

a. Multiply by 3, then add 7.

$$3x + 7$$

b. ~~Subtract 7, then cube.~~ cube, then subtract 7

$$x^3 - 7$$

c. $f(x) = m + 9$

add 9

d. $g(x) = \frac{x-3}{3}$

Subtract 3, divide by 3

4. Given $n = 7x - 8$, rewrite this in function notation.

$$f(x) = 7x - 8$$

5. Given $l = 2x^2 + 2$, rewrite this in function notation.

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

6. Given $f(x) = 9x + 9$, rewrite using a two-variable equation.

$$y = 9x + 9$$

7. Given $r(x) = 3x^2 + 4x$, rewrite using a two-variable equation.

$$y = 3x^2 + 4x$$

Net Change - $f(b) - f(a)$

1. Find the net change of $f(x) = 3x + 2$ from $(x = 1)$ to $(x = 4)$.

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

$$f(4) = 3(4) + 2 = 14$$

$$14 - 5 = 9$$

2. Find the net change of $p(x) = x^2 + 3$ from $(x = 2)$ to $(x = 3)$.

$$p(2) = 2^2 + 3 = 7$$

$$p(3) = 3^2 + 3 = 12$$

$$12 - 7 = 5$$

★ If an astronaut weighs 215 pounds on the surface of the earth, then her weight when she is x miles above the earth's surface is given by the function.

$$W(x) = 215 \left(\frac{3960}{3960+x} \right)^2$$

a. Evaluate $w(600)$. What does this answer mean?

$$215 \left(\frac{3960}{3960+600} \right)^2 = \frac{234135}{1444}$$

b. Find the net change in the weight of the astronaut from an elevation of 600 miles to 6,000 miles.

$$215 \left(\frac{3960}{3960+6,000} \right)^2 = \frac{234135}{6889}$$

$$\frac{234135}{6889} - \frac{234135}{1444} = -128.56$$

Composition of Functions

1. Suppose $f(x) = 10x + 4$ and $g(x) = 6x + 4$.

a. Find $f(g(x))$.

$$g(x) = 6x + 4$$

$$f(x) = 10(6x+4)+4 \rightarrow 60x+40+4 = 60x+44$$

b. Find $g(f(x))$.

$$f(x) = 10x + 4$$

$$g(x) = 6(10x+4)+4 \rightarrow 60x+24+4 = 60x+28$$

2. Suppose $f(x) = 4x + 1$ and $g(x) = 3x + x$.

a. Find $f(g(x))$.

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

$$f(x) = 4(3x+x)+1 \rightarrow 12x+4x+1 \rightarrow 16x+1$$

* You will get a better example on the exam*
(if there is a question like this on there)

b. Find $g(f(x))$.

$$f(x) = 4x + 1$$

$$g(x) = 3(4x + 1) + 4x + 1 \rightarrow 12x + 3 + 4x + 1 = 16x + 4$$

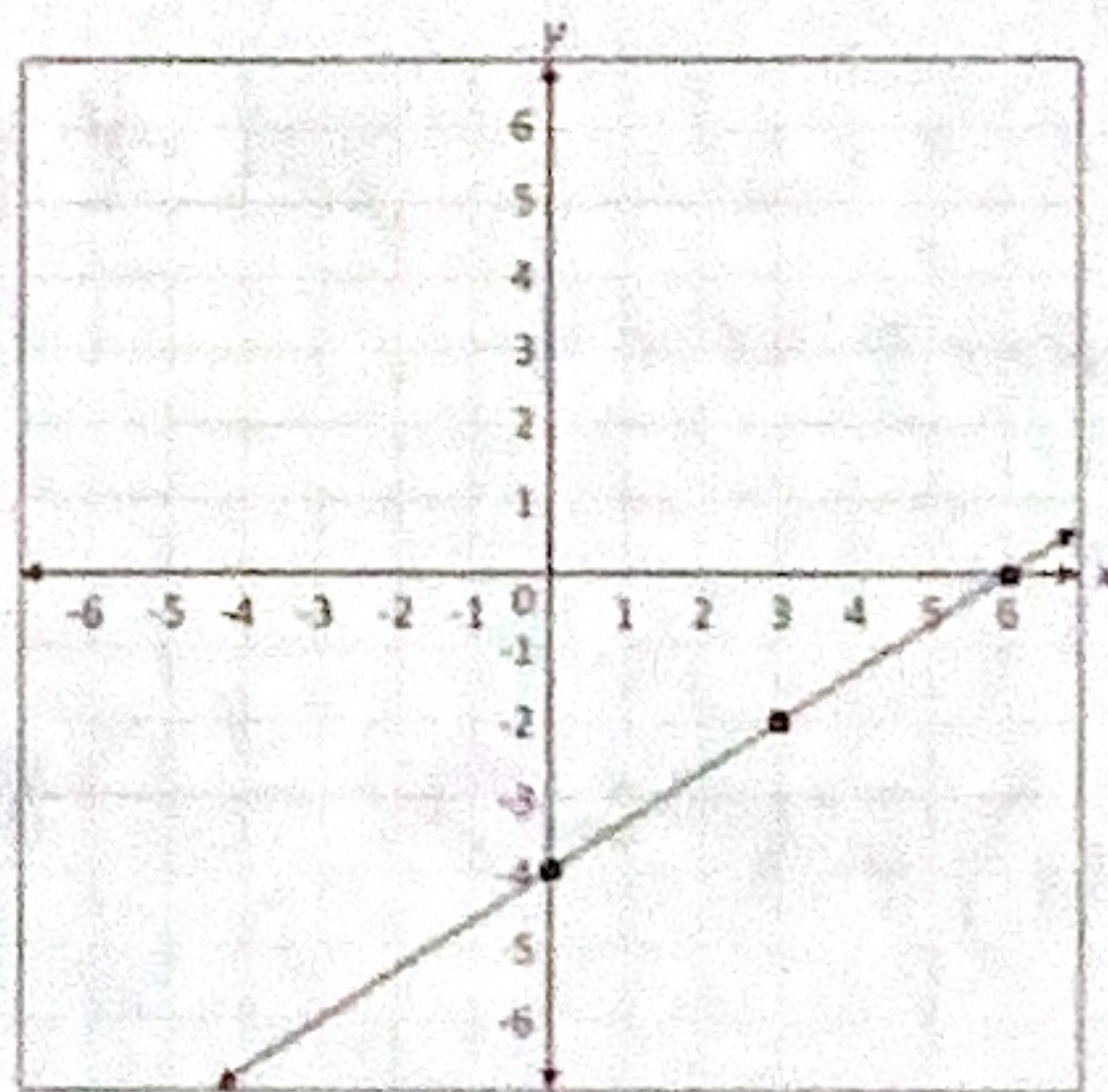
3. Suppose $f(x) = 7x + 2$ and $g(x) = -2x + 3$. Find $g(f(4))$.

$$f(4) = 7(4) + 2 = 30$$

$$g(30) = -2(30) + 3 = -57$$

4. Look at the table, graph, and equation and evaluate the following.

x	f(x)
-9	2
-3	8
-1	6
4	-3
7	4



$$h(x) = 2x + 2$$

a. $f(-1) = 6$

b. $g(-2) = -5$

c. $h(8) = 18$

d. $f(g(1)) = 8$ $g(1) = -3 \rightarrow f(-3) = 8$

e. $h(f(4)) = -4$ $f(4) = -3 \rightarrow h(-3) = -4$

f. $f(g(h(1))) = 6$

$$h(1) = 4 \rightarrow g(4) = -1 \rightarrow f(-1) = 6$$

Inverse Functions

1. Find $f^{-1}(x)$ if $f(x) = 5x - 1$.

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

$$f(x) = 5x - 1$$

$$y = 5x - 1$$

$$x = \frac{y+1}{5}$$

$$x = \frac{y+1}{5}$$

$$\frac{x+1}{5} = \frac{5y}{5}$$

$$y = \frac{x+1}{5}$$

2. Find $f(x)^{-1}$ if ~~$f(x) = 3x + 5$~~ $f(x) = \frac{x-5}{3}$

$$f(x) = 3x + 5$$

$$y = 3x + 5$$

$$x = \frac{y-5}{3}$$

$$\frac{x-5}{3} = \frac{3y}{3}$$

$$y = \frac{x-5}{3}$$

$$f^{-1}(x) = \frac{x-5}{3}$$

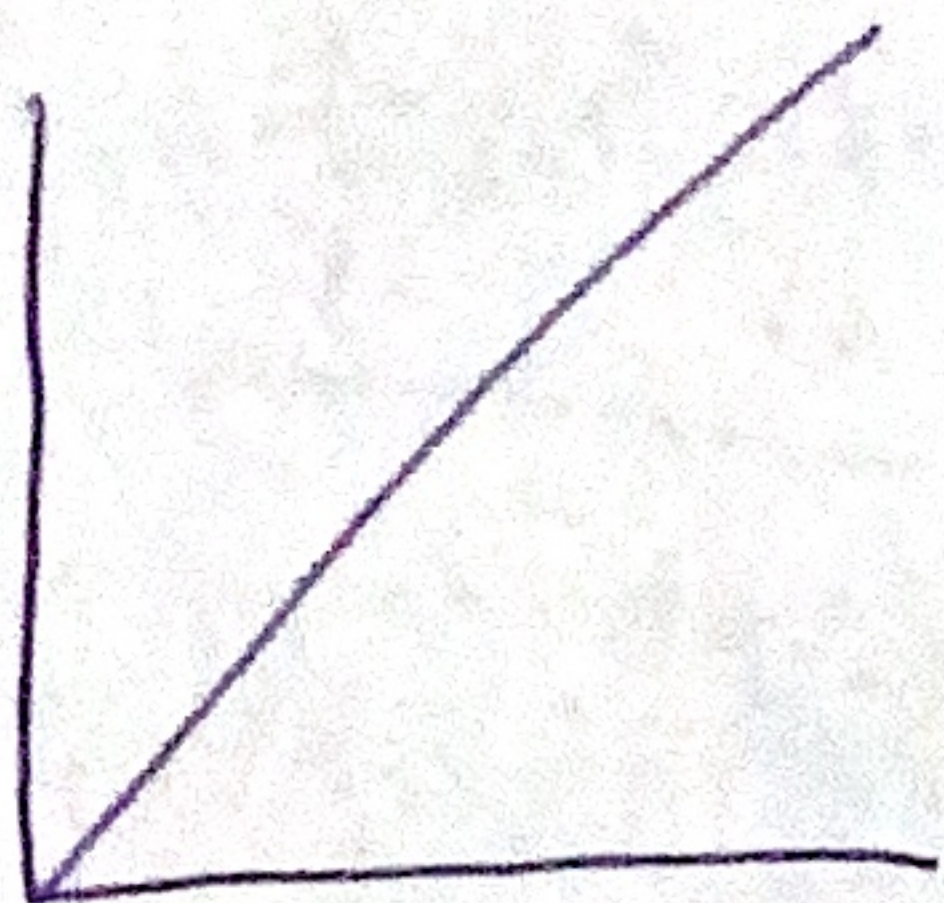
3. Fill in the inverse of the following tables.

x	f(x)
1	4
2	8
3	16
4	32

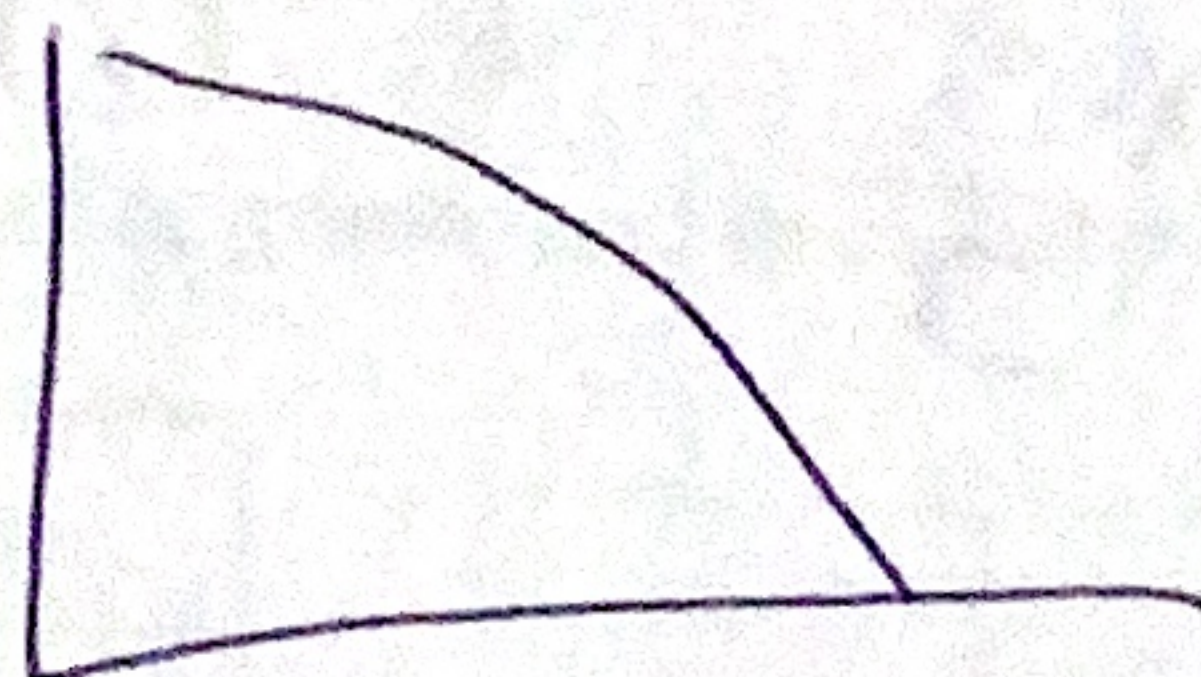
x	$f(x)^{-1}$
4	1
8	2
16	3
32	4

Graphing a Function from a Verbal Description

1. When you turn on a bunsen burner in the lab, the temperature depends on how long the burner has been on. Create a graph to represent the situation.

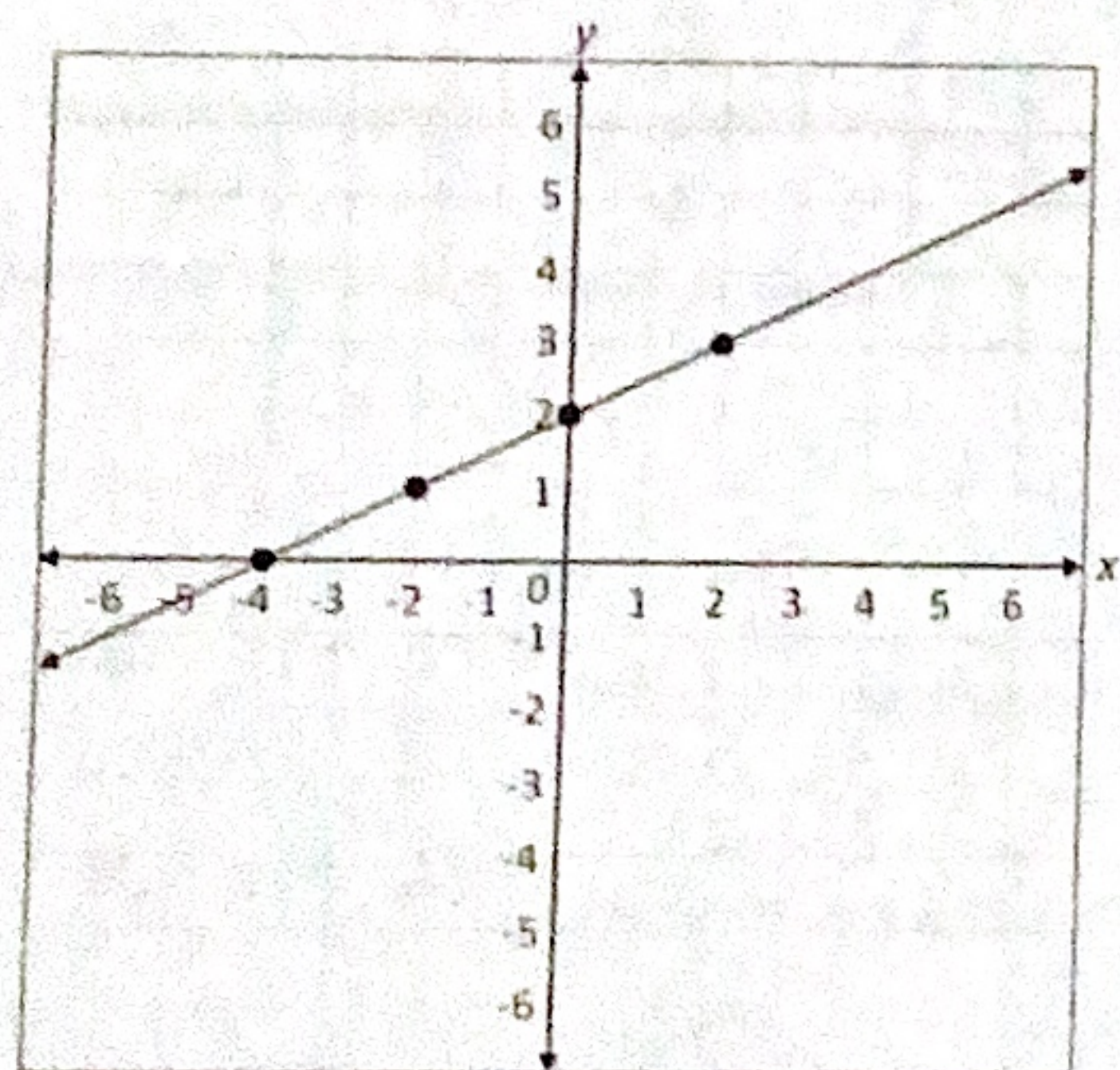


2. A diver is standing at the top of a diving board, ready to jump in. Create a graph to represent the situation.

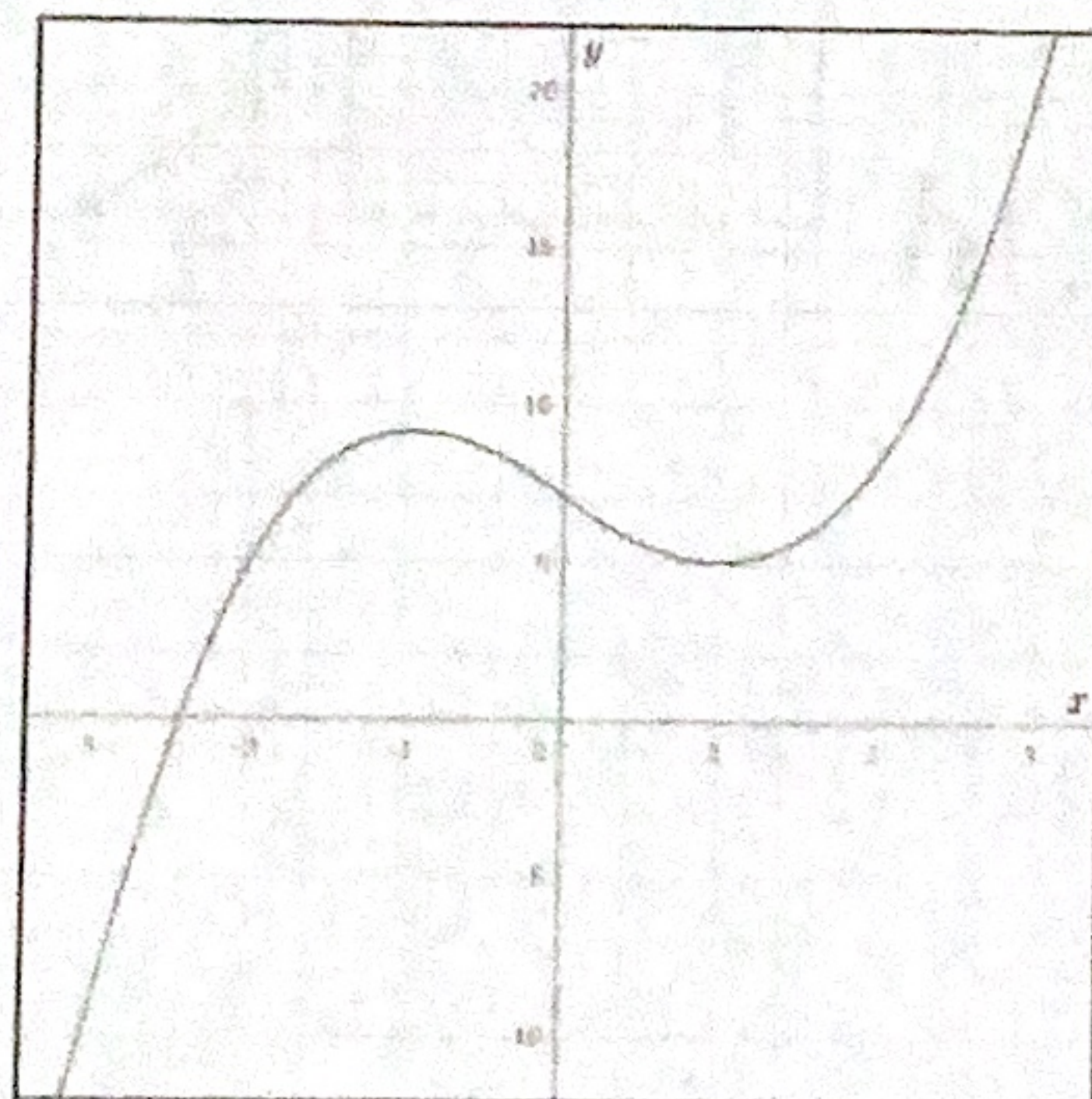


Graphs of Basic Functions

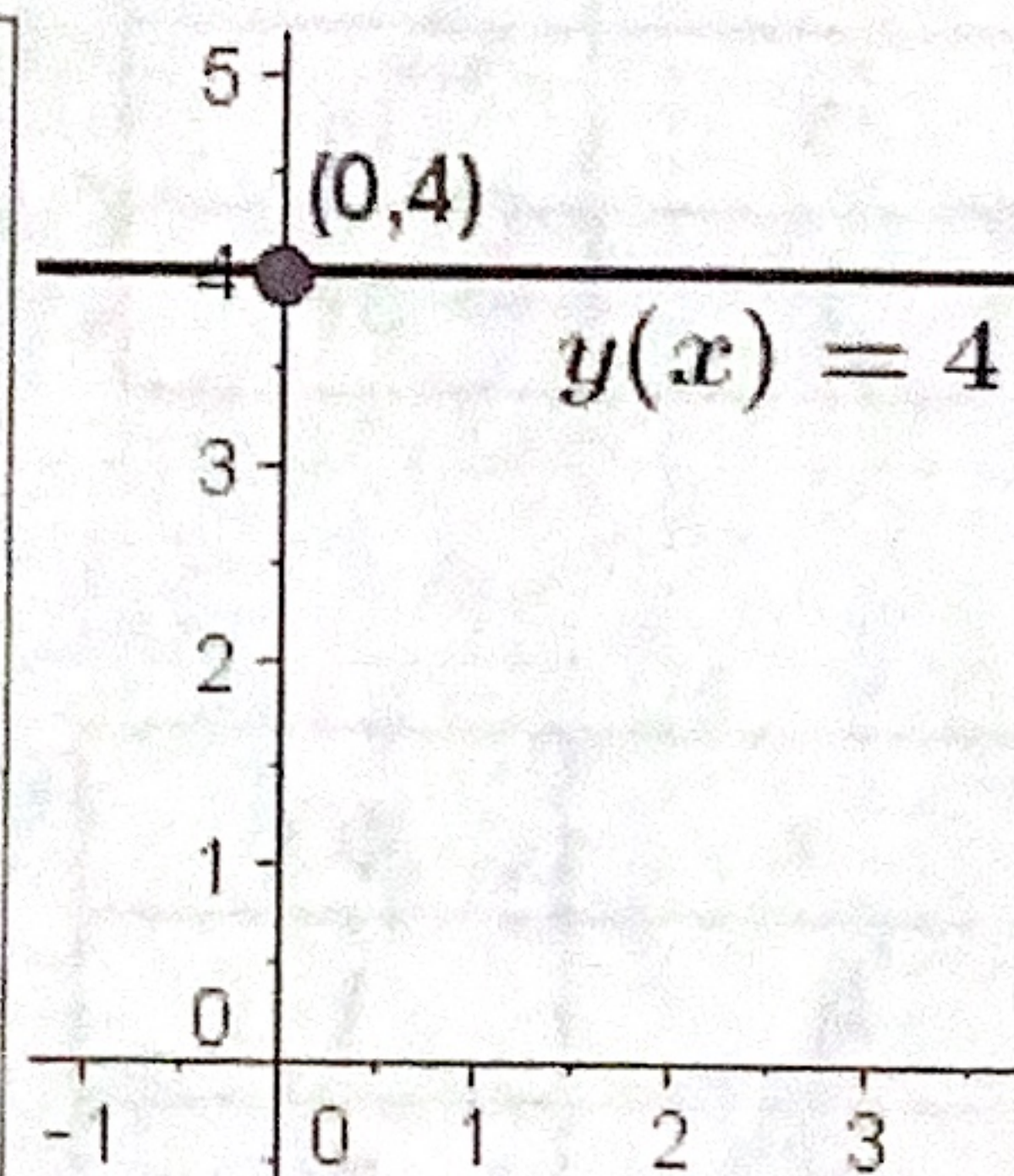
1. Name each of the following graphs.



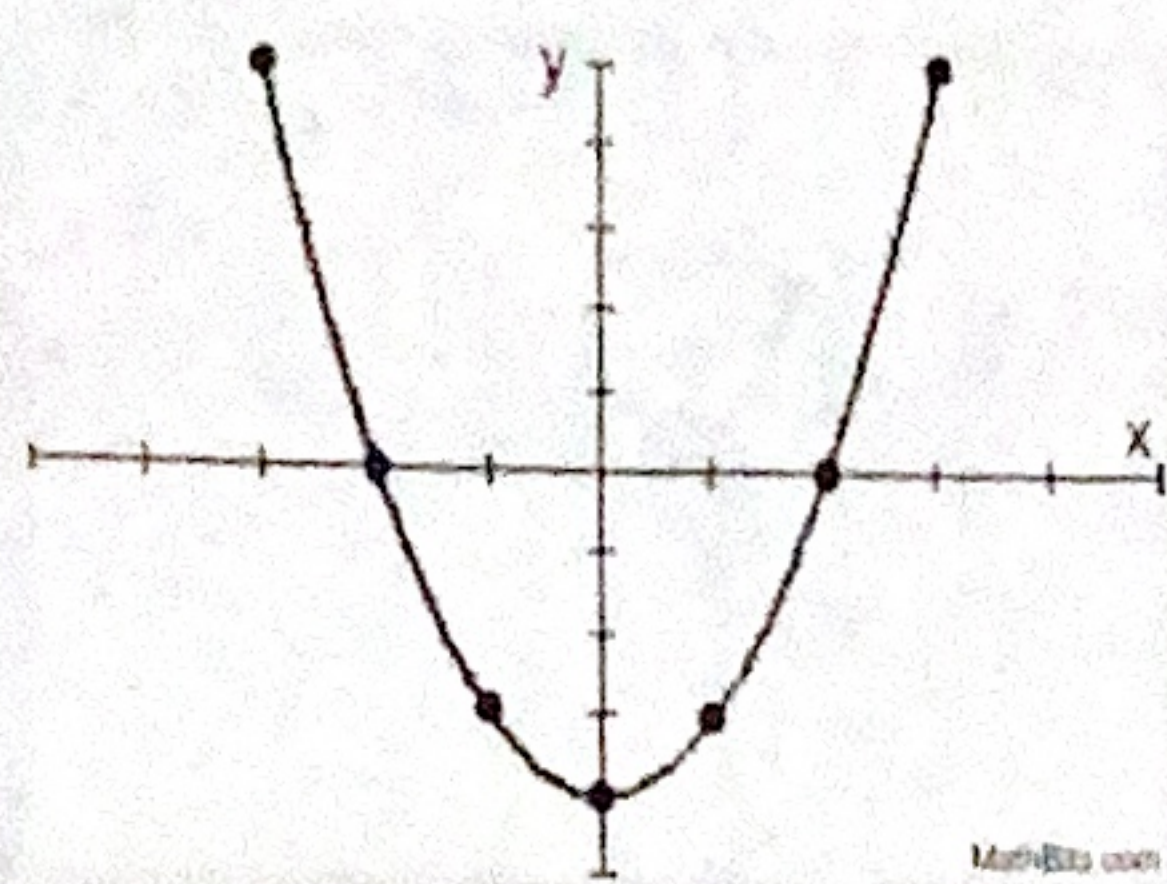
linear



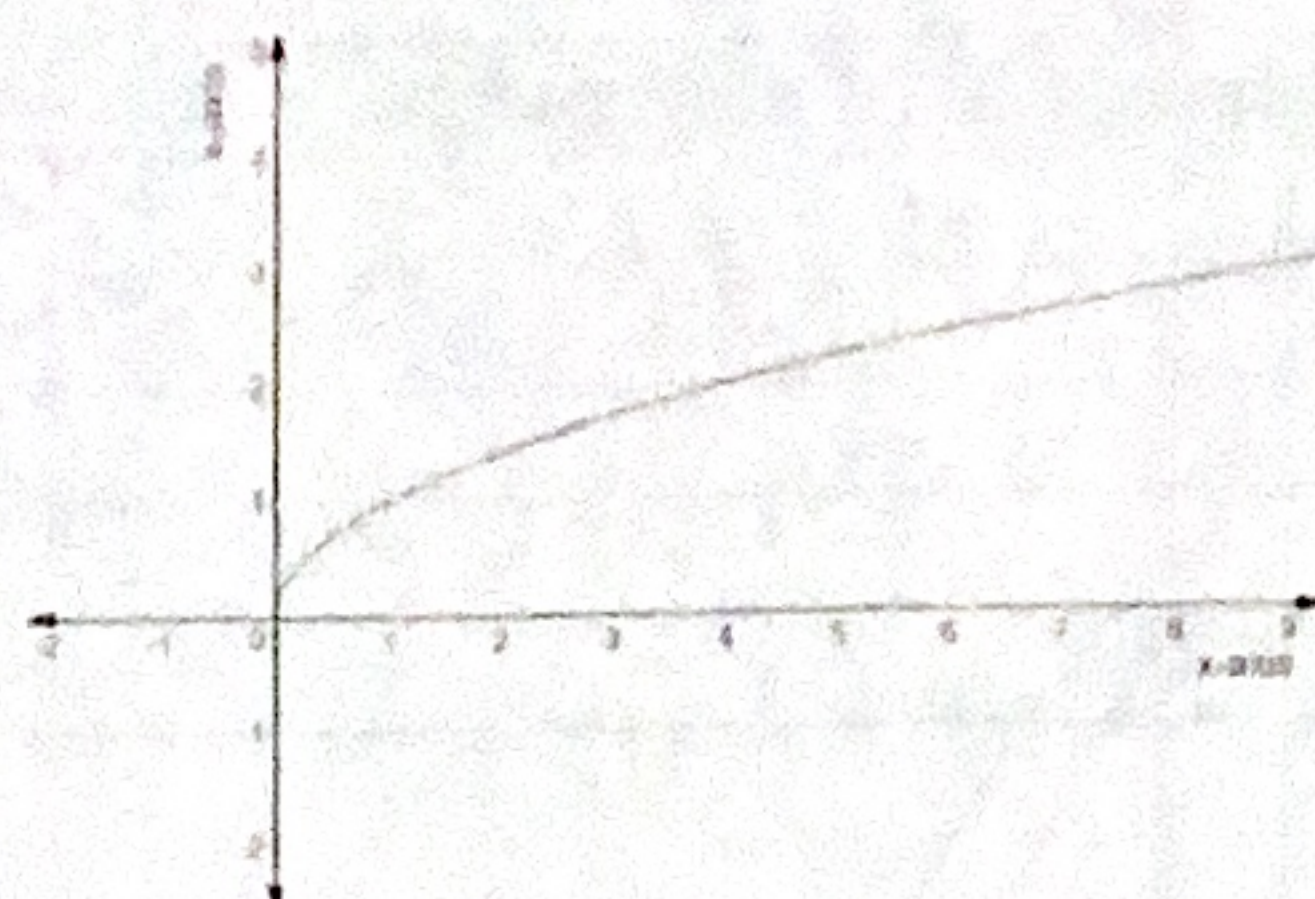
cubic



constant



quadratic



square root

Domain & Range/Local Max. & Min./Increasing & Decreasing

1. When you are writing your domain/range, when would you write parentheses?

open points, infinity

2. When you are writing your domain/range, when would you write with brackets?

closed points

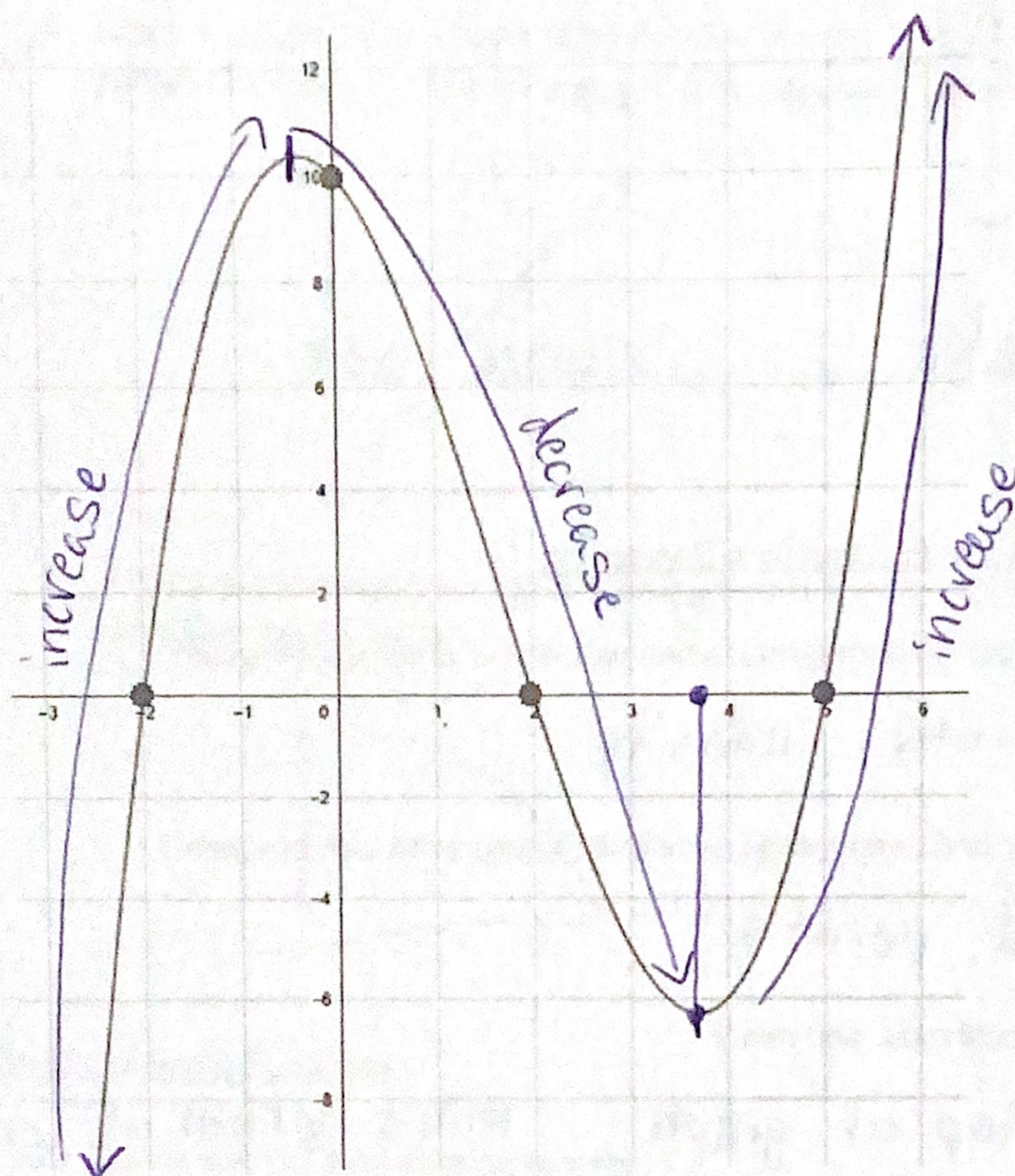
3. How do you find your local max. and min.?

max = top of graph min = bottom of graph

4. How do you find the increasing section of a graph? The decreasing section?

follow the graph until you reach
the top/bottom, write it down,
then continue until you followed
the whole graph

Find all the listed elements of this graph.



Domain: $\mathbb{R}$ or $(-\infty, \infty)$

Range: $\mathbb{R}$ or $(-\infty, \infty)$

Increase: $(-\infty, 0)$ $(3.5, \infty)$

Decrease: $(0, 3.5)$

Max.: max @ $y = 10$

Min.: min @ $y = -6$



Piecewise Functions

$$1. f(x) = \begin{cases} 4x + 5 & \text{if } x < 0 \\ 4x + 8 & \text{if } x \geq 0 \end{cases}$$

+

$$\begin{cases} 1 \sqrt{4x+5} & \text{if } x < 0 \\ 2 \sqrt{4x+8} & \text{if } x \geq 0 \end{cases}$$

- a. $f(-1)$ $4(-1)+8=4$ (2) $\rightarrow 4(-1)+8=4$ (1)
 b. $f(-5)$ $4(-5)+4=-16$ (1) $\rightarrow 4(-5)+4=-16$ (1)
 c. $f(2)$ $4(2)+8=16$ (2) $\rightarrow 4(2)+8=16$ (2)
 d. $f(-10)$ $4(-10)+8=-32$ (1) $\rightarrow 4(-10)+8=-32$ (1)

Systems of Linear Equations

1. Solve the following with substitution.

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

$$y = x + 1$$

$$2x - 3(x+1) = -1$$

$$2x - 3x - 3 = -1$$

$$-x - 3 = -1$$

$$+3 \quad +3$$

$$\hline -x = 2$$

$$x = -2$$

$$y = -2 + 1$$

$$y = -1$$

$$(-2, -1)$$

2. Solve the following with substitution.

$$-3x + 3y = 4$$

$$x = y - 3$$

$$-3(y-3) + 3y = 4$$

$$-3y + 9 + 3y = 4$$

$$9 = 4$$

No solution

3. Solve the following with elimination.

$$-6x + 5y = 1$$

$$6x + 4y = -10$$

$$-6x + 5y = 1$$

$$6x + 4y = -10$$

$$\hline 9y = -9$$

$$y = -1$$

$$6x + 4(-1) = -10$$

$$6x - 4 = -10$$

$$\frac{6x}{6} = \frac{-6}{6}$$

$$(-1, -1)$$

$$x = -1$$

4. Solve the following using elimination.

$$-3(-3x + 7y = -16)$$

$$-9 + 5y = 16$$

$$(-4, -4)$$

$$9x - 21y = 48$$

$$-9x + 5y = 16$$

$$-16y = 64$$

$$-16 \quad -16$$

$$y = -4$$

$$-3x + 7(4) = -16$$

$$-3x - 28 = -16$$

$$+28 \quad +28$$

$$-3x = 12$$

$$\frac{-3x}{-3} = \frac{12}{-3}$$

$$x = -4$$

5. Put the system of equations into an augmented matrix and then solve for row echelon form.

$$2x + 3y = 7$$

$$x - y = 1$$

$$y = 1$$

$$x - 1 = 1$$

$$x = 2$$

$$\left[\begin{array}{cc|c} 2 & 3 & 7 \\ 1 & -1 & 1 \end{array} \right]$$

$$R_1 = R_1 \leftrightarrow R_2 \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 2 & 3 & 7 \end{array} \right]$$

$$(2,1) \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 2 & 3 & 7 \end{array} \right] R_2 = R_2 - 2R_1 \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 0 & 5 & 5 \end{array} \right]$$

$$\left[\begin{array}{cc|c} 1 & -1 & 1 \\ 0 & 5 & 5 \end{array} \right] R_2 = \frac{1}{5}R_2 \left[\begin{array}{cc|c} 1 & -1 & 1 \\ 0 & 1 & 1 \end{array} \right]$$

6. Using your calculator, put the system of equations into reduced row echelon form.

$$x + 2y + 3z = 6$$

$$2x - 3y + 2z = 14$$

$$3x + y - z = -2$$

$$x = 1$$

$$y = -2$$

$$z = 3$$

$$\left[\begin{array}{ccc|c} 1 & 2 & 3 & 6 \\ 2 & -3 & 2 & 14 \\ 3 & 1 & -1 & -2 \end{array} \right]$$

$\rightarrow$

$$\left[\begin{array}{ccc|c} 1 & 0 & 0 & 1 \\ 0 & 1 & 0 & -2 \\ 0 & 0 & 1 & 3 \end{array} \right]$$

$$(1, -2, 3)$$