Name_____ Date_____

8A, Algebra 1 Period_____

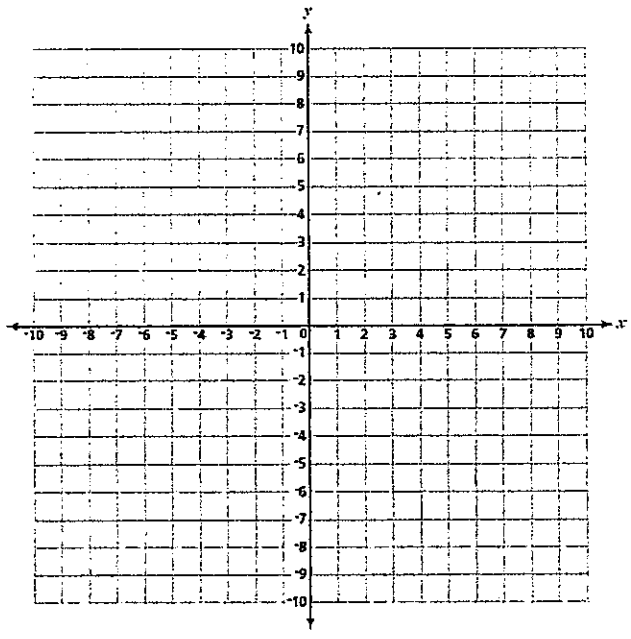
Functions II Test Review

1) If $g(x) = 5(x + 3)^2 - 4$, then which of the following is the value of $g(2)$?

(1) 129 (2) 121 (3) 165 (4) 5

2) Movie tickets now average $9.85 a ticket, but are increasing 15% per year. How much will they cost 5 years from now?

3) Graph $y = -(x + 3)^3 - 3$ and state its Domain and Range.



Domain:_____

Range:_____

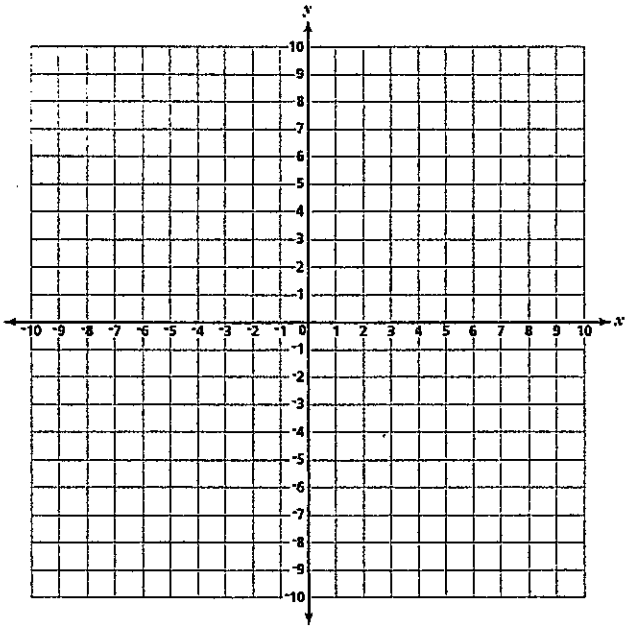
4) Describe how the following graph would change in relation to its parent graph?

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

5) The graph of a square root is created by transforming the graph $y=\sqrt{x}$. What is the equation of the new function if the original is shifted **five units to the right and four units up?**

6) Dinner at your grandfather's favorite restaurant now costs $25.25 and has been increasing steadily at 4% per year. How much did it cost **35 years ago** when he was courting your grandmother?

7) (a) Graph $y=|x+3|-2$ on the following coordinate plane.



(b) What is the vertex of the function._____

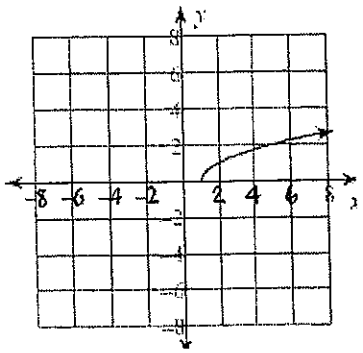
(c) State the domain of the function._____

(d) State the range of the function_____

8) Describe how the following graph would change in relation to its parent graph?

$$y=3(x+4)^2+5$$

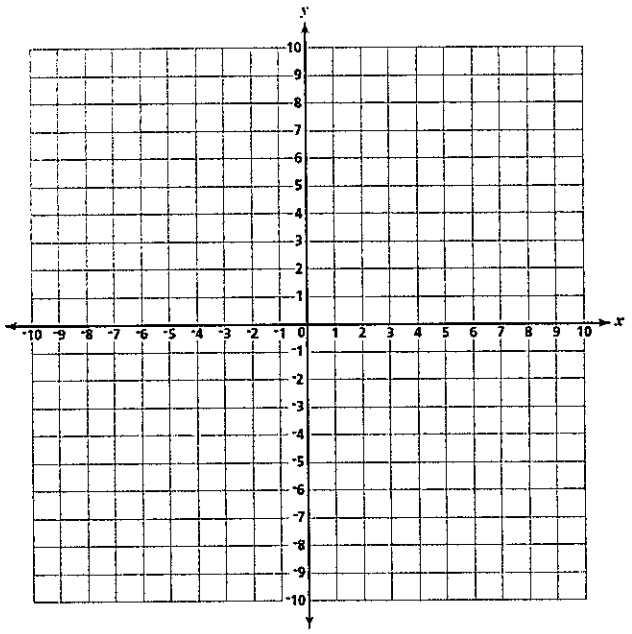
9) What is the equation for the following function?



10) A bank advertised a rate of 3% interest compounded annually on one of its CD's. If a 15 year old CD is **now worth** $4,525.00, find its original price.

11) Consider the function $f(x) = (x + 2)^3 + 1$ over the interval $-4 \leq x \leq 0$.

a) Graph $f(x)$ on the following grid.



b) State the range of the function over this interval_____

c) Find the average rate of change of $f(x)$ over the interval: $-3 \leq x \leq -1$

12) Identify the domain and range of each of the following graphs.

a) $y=\sqrt{x+4}$

Domain:_____

Range:_____

b) $y=-\sqrt{x}-3$

Domain:_____

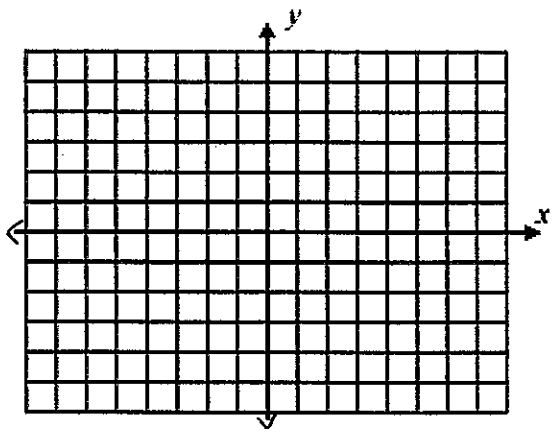
Range:_____

13) The parent function for an exponential function:

a) goes through which quadrants on the coordinate plane_____

b) goes through which coordinate on the y-axis_____

14) Graph the function $f(x)=-\sqrt{x+4}+2$ on the grid below. Then state its domain and range.



Domain:_____

Range:_____

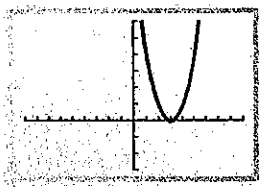
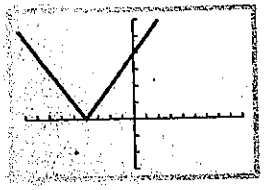
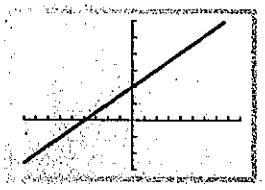
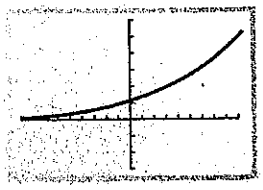
15) The graph of $y=-x^2$ is translated to the right 4 units and up 3 units. The equations of the new function is?

(1) $y=-(x+4)^2+3$ (2) $y=-(x+3)^2+4$ (3) $y=-(x-4)^2+3$ (4) $y=(-x+4)^2+3$

16) The point (4,8) is on the graph of $y=g(x)$. Which point is on the graph of $k(x)=g(x-3)$

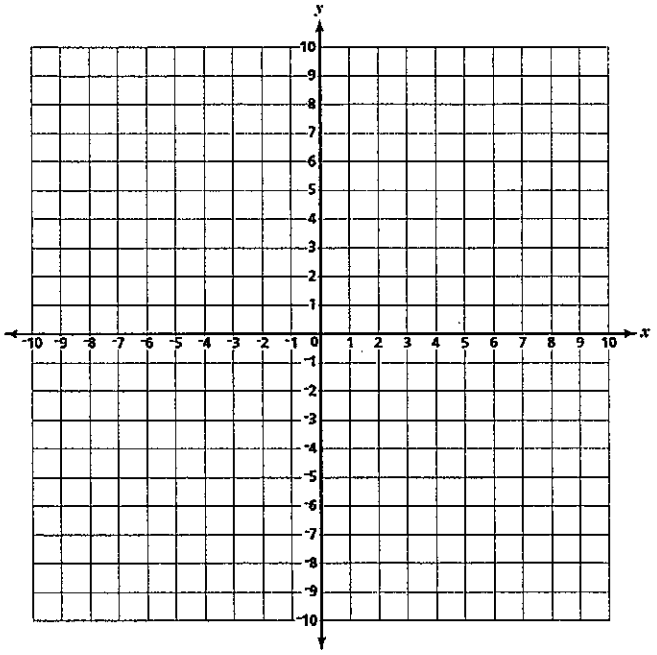
(1) (4,8) (2) (8,4) (3) (1,8) (4) (7,8)

17) Identify the functions as linear, exponential, or neither.

18) Graph the piecewise functions. List the Domain and the Range of the function.

$$f(x)=\begin{cases} x^2+4, & x<0 \\ \sqrt{x}+4, & x\geq 0 \end{cases}$$



Domain:_____

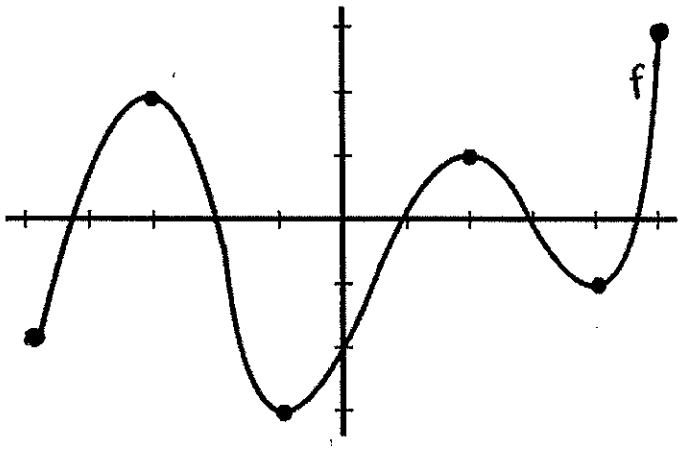
Range:_____

19) What is the range of the function: $y=|x-3|+5$?

20) What is the domain of the folowing function? $y=\sqrt{x-4}$

21) What is the average rate of change of $f(x)=x^2+4x+4$ from $[-1,1]$

22) Using the graph of the function $f(x)$ shown below, answer the following questions.



(a) Find the value of each of the following:

$f(-3) =$

$f(0) =$

$f(4) =$

(b) For how many values of x does $f(x) = 1$? Illustrate on the graph.

(c) What is the y-intercept of this relation?_____

What are the x-intercepts of this relation?(Estimate if necessary)_____

(d) State the relative maximum and relative minimum values of the graph.

Relative Maximum_____ Relative Minimum_____

(e) Explain why the graph represents a function.

(f) What are the absolute maximum and absolute minimum values of this function?

Absolute Maximum_____ Absolute Minimum_____

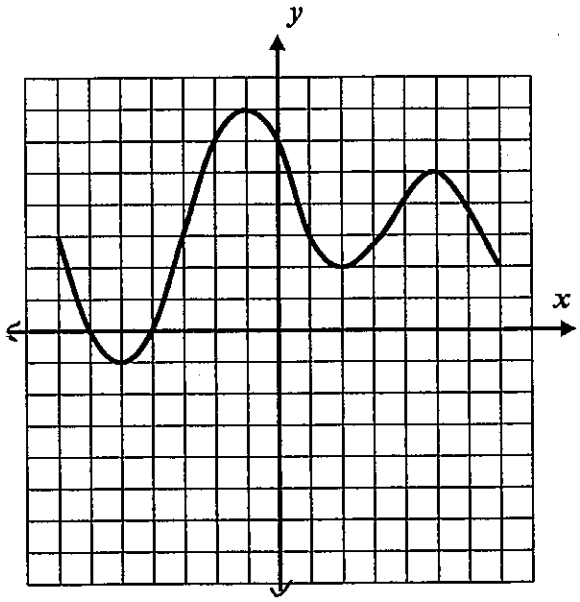
(g) Give **one** interval over which the function is increasing and **one** interval in which it is decreasing?

Increasing_____ Decreasing_____

GRAPHICAL FEATURES AND TERMINOLOGY
COMMON CORE ALGEBRA I

There is a lot of terminology associated with the **graph of a function**. Many of the terms have names that are descriptive, but still, work is needed to master the ideas.

23) The function $y = f(x)$ is shown graphed below over the interval $-7 \le x \le 7$.



(a) Find the maximum and minimum values of the function. State the values of x where they occur as well.

(b) What is the y-intercept of the function? Explain why a function cannot have more than one y-intercept.

(c) Give the x-intercepts of the function. These are also known as the function's **zeroes** because they are where $f(x) = 0$.

(d) Would you characterize the function as **increasing or decreasing** on the domain interval $-5 \le x \le -1$? Explain your choice.

(e) Give one additional interval over which the function is increasing and one over which it is decreasing.

Increasing: _____

Decreasing: _____

(f) The following points are known as **turning points.** Each can be classified as a **relative maximum** or a **relative minimum.** State which you think each is.

$(-5,-1)$	$(-1,7)$	$(2,2)$	$(5,5)$
relative minimum	relative minimum	relative minimum	relative minimum
or	or	or	or
relative maximum	relative maximum	relative maximum	relative maximum

24) Determine whether the following relations are linear, quadratic, cubic or neither. Show all work!

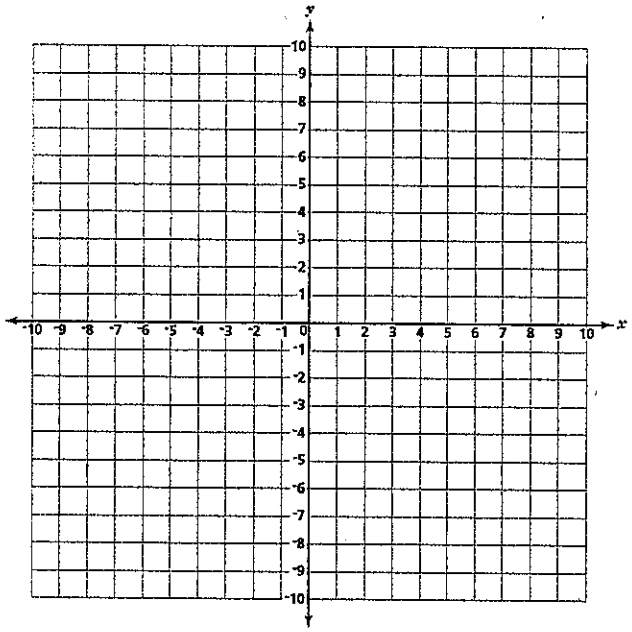
a)

x	y
1	10
2	20
3	30
4	40
5	50

b)

x	y
-2	-7
-1	0
0	1
1	2
2	9
3	28

25) (a) Graph $y = 2^x + 3$ on the following coordinate plane over the interval [-2, 2]



(b) What is the y-intercept of the function._____

(c) State the domain of the function._____

(d) State the range of the function_____

Name Key
8A, Algebra 1

Date_____
Period_____

Functions II Test Review

1) If $g(x) = 5(x + 3)^2 - 4$, then which of the following is the value of $g(2)$?

(1) 129 (2) 121 (3) 165 (4) 5

$x=2$

$g(x) = 5(x+3)^2 - 4$
$g(2) = 5(2+3)^2 - 4$
$g(2) = 5(5)^2 - 4$
$g(2) = 5(25) - 4$
$g(2) = 125 - 4$
$g(2) = 121$

Can check answer in calc tbl

2) Movie tickets now average $9.85 a ticket, but are increasing 15% per year. How much will they cost 5 years from now?

P t R n

$\frac{15}{100} = .15$

15%

2←

$A = P(1+r)^n$
$A = 9.85(1+15\%)^5$
$A = 9.85(1+.15)^5$
$A = 9.85(1.15)^5$
$A = 19.81186833$
$\$19.81$

$ = round to the nearest hundredth

3) Graph $y = -(x + 3)^3 - 3$ and state its Domain and Range.

Reflection over the x-axis

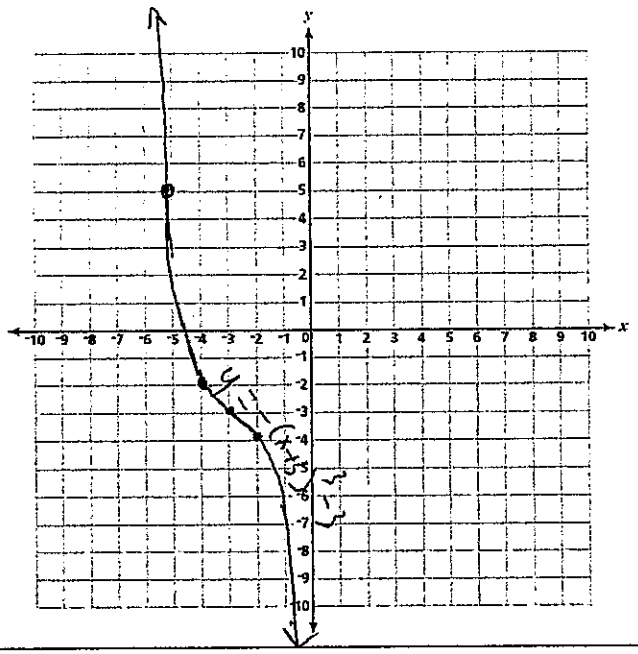
Translated 3 units right and 3 units down

X	Y
-5	5
-4	-2
-3	-3
-2	-4

(-4, 24)

(-1, 11)

★ arrows b/c NO constraints given



→ set builder

Domain: $\{x \mid x \in \mathbb{R}\}$ or $(-\infty, \infty)$ or all reals

interval notation

Range: $\{y \mid y \in \mathbb{R}\}$ or $(-\infty, \infty)$ or all reals

4) Describe how the following graph would change in relation to its parent graph?

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

Translated (or shifted) 3 units right and 5 units down from (0,0)

5) The graph of a sq. root is created by transforming the graph $y=\sqrt{x}$. What is the equation of the new function if the original is shifted **five units to the right** and **four units up**?

$$y=\sqrt{x-5}+4$$

6) Dinner at your grandfather's favorite restaurant now costs $25.25 and has been increasing steadily at 4% per year. How much did it cost **35 years ago** when he was courting your grandmother?

$A = P(1+r)^n$

$25.25 = P(1+4\%)^{35}$

$25.25 = P(1+.04)^{35}$

$25.25 = P(1.04)^{35}$

$\frac{25.25}{(1.04)^{35}} = \frac{P(1.04)^{35}}{(1.04)^{35}}$

$6.39874\ldots = P$

★ Round to the nearest hundredth

$P = \$6.40$

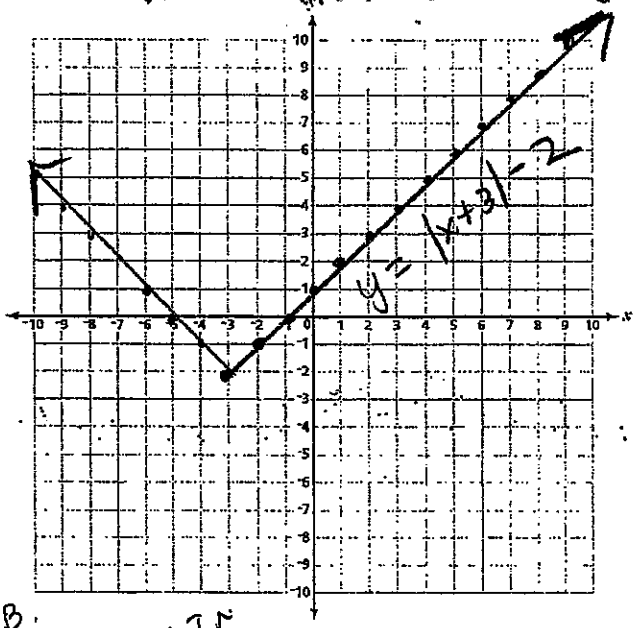
7) (a) Graph $y=|x+3|-2$ on the following coordinate plane. (MATH → NUM; approx sorry)

X	Y
-10	5
-9	4
-8	3
-7	2
-6	1
-5	0
-4	-1
-3	-2
-2	-1
-1	0
0	1
1	2

X	Y
2	3
3	4
4	5
5	6
6	7
7	8
8	9
9	10

★ Copy all x-values you can graph from -10 to +10

★ arrows b/c NO constraints given



(b) What is the vertex of the function? $(-3,-2)$

(c) State the domain of the function $\{x \mid x \in \mathbb{R}\}$ → S.B. or $(-\infty,\infty)$ → I.N. or all reals

(d) State the range of the function $\{y \mid y \geq -2\}$ $[-2,\infty)$

8) Describe how the following graph would change in relation to its parent graph?

$y=3(x+4)^2+5$ narrower (vertically stretched) by a scale factor of 3 translated (shifted) 4 units left and 5 units up from (0,0)

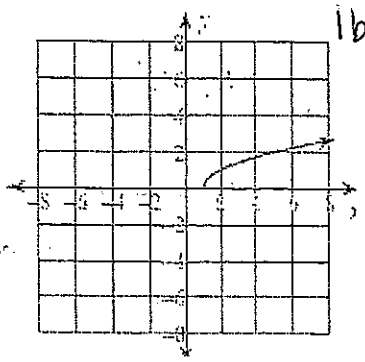
9) What is the equation for the following function?

SQUARE ROOT FUNCTION $y=\sqrt{x}$

From (0,0) it translated 1 unit right

$y=\sqrt{x-1}$

Starting point: (1,0)



10) A bank advertised a rate of 3% interest compounded annually on one of its CD's. If a 15 year old CD is **now worth** $4,525.00, find its original price.

$A = P(1+r)^n$

$4525 = P(1+3\%)^{15}$

$4525 = P(1+.03)^{15}$

$4525 = P(1.03)^{15}$

$\frac{4525}{(1.03)^{15}} = \frac{P(1.03)^{15}}{(1.03)^{15}}$

$P = 2904.425312...$

$P = \$2904.43$

★ Round to the nearest hundredth

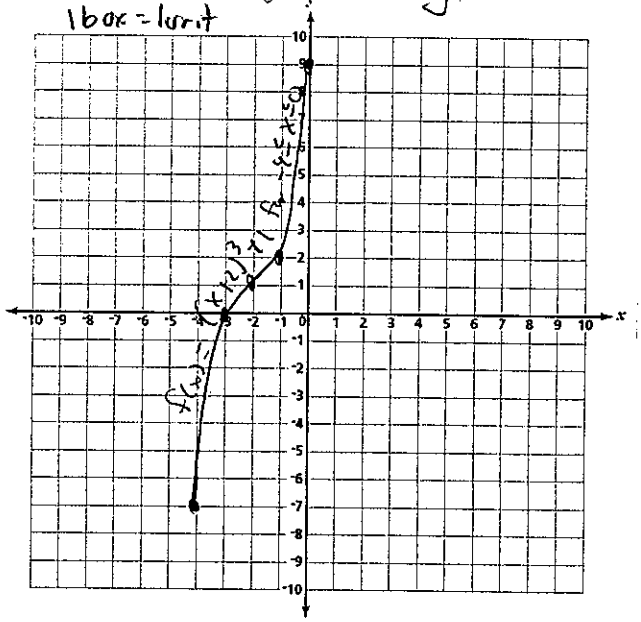
11) Consider the function $f(x) = (x+2)^3 + 1$ over the interval $-4 \le x \le 0$.

Translated 2 units left + 1 up from (0,0)

★ NU arrows b/c constraints given

a) Graph $f(x)$ on the following grid.

X	f(x)
-4	-7
-3	0
-2	1
-1	2
0	9



b) State the range of the function over this interval $\{y \mid -7 \le y \le 9\}$ or $[-7, 9]$

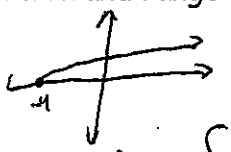
↑ Set builder ↑ Interval notation

c) Find the average rate of change of $f(x)$ over the interval: $-3 \le x \le -1$ (x_1 to x_2)

$\frac{f(x_2)-f(x_1)}{x_2-x_1}$ $\frac{f(-1)-f(-3)}{-1-(-3)}$ $\frac{2-0}{-1-(-3)} = \frac{2}{2} = \boxed{1}$

12) Identify the domain and range of each of the following graphs.

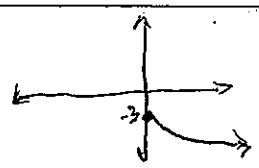
a) $y=\sqrt{x+4}$ ↓ 4 units left



Domain: $[-4,\infty)$ or $\{x \mid x \geq -4\}$

Range: $[0,\infty)$ or $\{y \mid y \geq 0\}$

b) $y=-\sqrt{x}-3$ ↓ upside down ↓ 3 units down



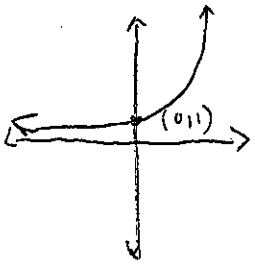
Domain: $[0,\infty)$ or $\{x \mid x \geq 0\}$

Range: $(-\infty,-3]$ or $\{y \mid y \leq -3\}$

13) The parent function for an exponential function: (parent function)

a) goes through which quadrants on the coordinate plane I and II

b) goes through which coordinate on the y-axis (0,1)



14) Graph the function $f(x)=-\sqrt{x+4}+2$ on the grid below. Then state its domain and range.

$x+4 \geq 0$

$-4\ -4$

$x \geq -4$ ← points why it starts here

x	f(x)
-4	2
-3	1
0	0
5	-1

No decimals only under #'s! Interval

* Constraint

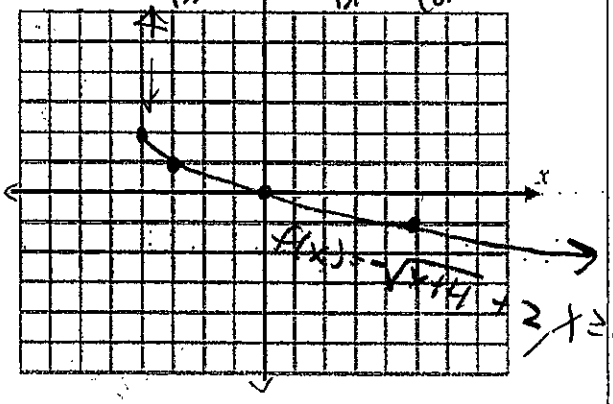
I.N.

Domain: $[-4,\infty)$ or $\{x \mid x \geq -4\}$ ← S.B.

Range: $(-\infty,2]$ or $\{y \mid y \leq 2\}$

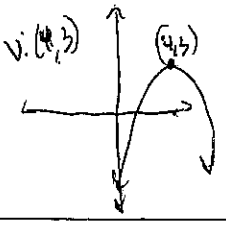
↑ must be in numerical order!

1 box = 1 unit; ≥ arrow on the left b/c of the constraint



15) The graph of $y=-x^2$ is translated to the right 4 units and up 3 units. The equations of the new function is?

(1) $y=-(x+4)^2+3$ (2) $y=-(x+3)^2+4$ (3) $y=-(x-4)^2+3$ (4) $y=(-x+4)^2+3$



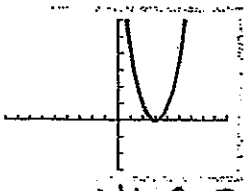
16) The point (4,8) is on the graph of $y=g(x)$. Which point is on the graph of $k(x)=g(x-3)$

(1) (4,8) (2) (8,4) (3) (1,8) (4) (7,8)

K(x) is translating the function g(x) 3 units to the right (add 3 to the x-coordinate) ←

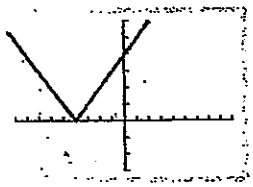
$(4+3,8)=(7,8)$

17) Identify the functions as linear, exponential, or neither.



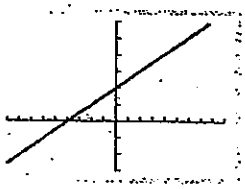
neither

(quadratic)

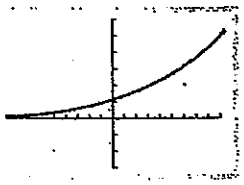


neither

(absolute)



linear



exponential

18) Graph the piecewise functions. List the Domain and the Range of the function.

$$f(x)=\begin{cases} x^2+4, & x<0 \\ \sqrt{x}+4, & x\geq 0 \end{cases}$$

* 1 open domain value + 1 closed domain value will always be closed!

$f(x)=\sqrt{x}+4$, $x\geq 0$ (2nd x^2)

x	f(x)
0	4
1	5
4	6
9	7

closed

• NO decimals

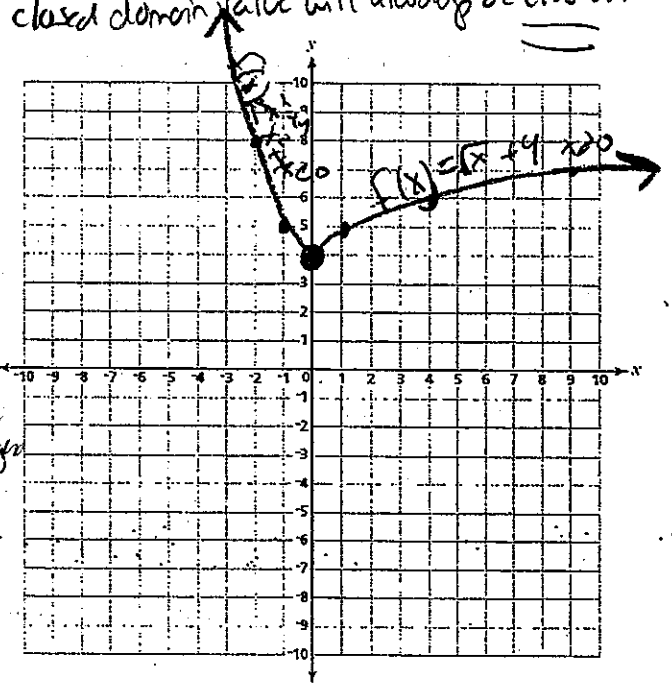
• copy only wide #'s from graph

$f(x)=x^2+4$, $x<0$

x	f(x)
-2	8
-1	5
0	4

OPEN

I.N. S.B.

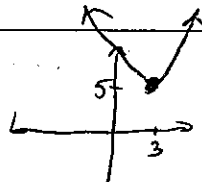


Domain: $(-\infty,\infty)$ OR $\{x \mid x\in\mathbb{R}\}$ or all reals

Range: $[4,\infty)$ OR $\{y \mid y\geq 4\}$

19) What is the range of the function: $y=|x-3|+5$?

$\{y \mid y\geq 5\}$ OR $[5,\infty)$



V: (3,5)

20) What is the domain of the folowing function? $y=\sqrt{x-4}$ (4 units right)

$\{x \mid x\geq 4\}$ $[4,\infty)$

$x-4\geq 0$

$+4\ +4$

$x\geq 4$

21) What is the average rate of change of $f(x)=x^2+4x+4$ from $[-1,1]$

$f(1)=(1)^2+4(1)+4$

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

$f(1)=9$

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

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

$f(-1)=1$

$\frac{f(x_2)-f(x_1)}{x_2-x_1}$ (x_1, x_2)

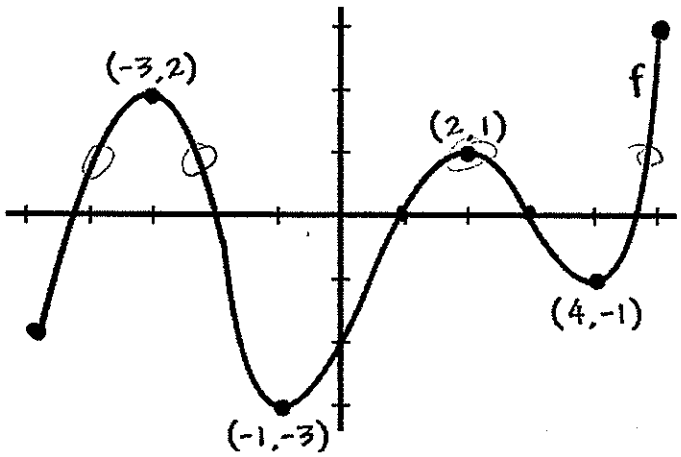
$\frac{f(1)-f(-1)}{1-(-1)}$

$\frac{9-1}{1-(-1)}=\frac{8}{2}=\boxed{4}$

x	f(x)
-1	1
0	4
1	9

* Can also show table as work

22) Using the graph of the function $f(x)$ shown below, answer the following questions.



(a) Find the value of each of the following:

$f(-3) =$ 2

$f(0) =$ −2

$f(4) =$ −1

(b) For how many values of x does $f(x) = 1$? Illustrate on the graph.

four

(c) What is the y-intercept of this relation? where $x=0$ $y = -2$ or $\{-2\}$

What are the x-intercepts of this relation? (Estimate if necessary) where $y=0$ $x = -4.2,\ x = -2,\ x = 1,\ x = 3,\ x = 4.8$ or $\{-4.2, -2, 1, 3, 4.8\}$

(d) State the relative maximum and relative minimum values of the graph.

Relative Maximum $y = 2$ or $(-3, 2)$; $y = 1$ or $(2, 1)$ — Relative Minimum $y = -3$ or $(-1, -3)$; $y = -1$ or $(4, -1)$

* must be a turning point

* In terms of y or give the coordinate ✗

(e) Explain why the graph represents a function. Because every element of the domain corresponds to one and only one element of the range.

(f) What are the absolute maximum and absolute minimum values of this function?

* can only have one.

Absolute Maximum $y = 3$ or $(5, 3)$ — Absolute Minimum $y = -3$ or $(-1, -3)$

* In terms of y, or give the coordinate ✗

(g) Give **one** interval over which the function is increasing and **one** interval in which it is decreasing?

Increasing $(-5, -3) \cup (-1, 2) \cup (4, 5)$; $\{x \mid -5 < x < -3$ or $-1 < x < 2$ or $4 < x < 5\}$

Decreasing $(-3, -1) \cup (2, 4)$; $\{x \mid -3 < x < -1$ OR $2 < x < 4\}$

* Describe with x-values ✗

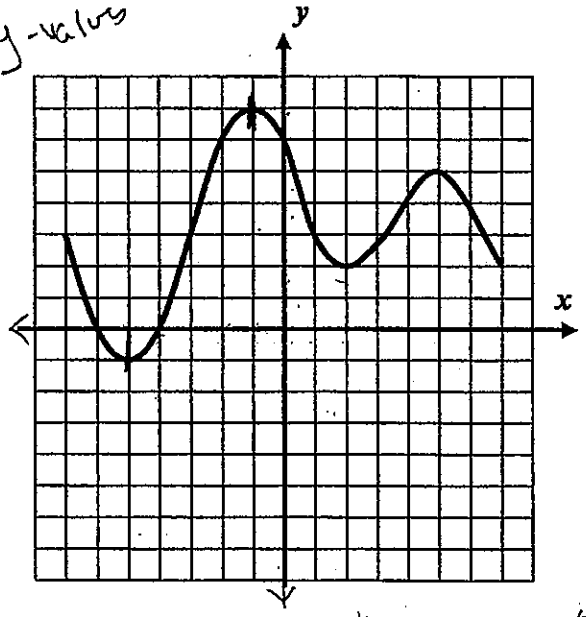
Can write in words or using set builder too

* Increasing between $x = -5$ and $x = -3$ or $\{x \mid -5 < x < -3\}$

GRAPHICAL FEATURES AND TERMINOLOGY
COMMON CORE ALGEBRA I

There is a lot of terminology associated with the **graph of a function**. Many of the terms have names that are descriptive, but still, work is needed to master the ideas.

23) The function $y = f(x)$ is shown graphed below over the interval $-7 \le x \le 7$:



(a) Find the maximum and minimum values of the function. State the values of x where they occur as well.

maximum $y = 7$ at $X = -1$ $(-1, 7)$

minimum $y = -1$ at $x = -5$ $(-5, -1)$

(b) What is the y-intercept of the function? Explain why a function cannot have more than one y-intercept.

$y = 6$ (when $x = 0$)

↳ B/C then there would be two outputs for one input of x.

★ Each element of the domain corresponds to one and only one element of the range

(c) Give the x-intercepts of the function. These are also known as the function's ~~zeroes~~ because they are where $f(x) = 0$.

$X = -6$ & $X = -4$

(d) Would you characterize the function as **increasing or decreasing** on the domain interval $-5 \le x \le -1$? Explain your choice.

★ Read from left to right

Increasing B/C y gets larger as x gets larger from −5 to −1

(e) Give one additional interval over which the function is increasing and one over which it is decreasing.

Increasing: $\{x \mid 2 < x < 5\}$ or $(2, 5)$ or Between $x = 2$ & $x = 5$

Decreasing: $\{x \mid -1 < x < 2\}$ or $(-1, 2)$ or Between $x = -1$ & $x = 2$

★ Describe in terms of x

(f) The following points are known as **turning points**. Each can be classified as a **relative maximum** or a **relative minimum**. State which you think each is.

★ Must be turning points

$(-5, -1)$ abs min too	$(-1, 7)$ abs max too	$(2, 2)$	$(5, 5)$
relative minimum	relative minimum	relative minimum	relative minimum
or	or	or	or
relative maximum	relative maximum	relative maximum	relative maximum

24) Determine whether the following relations are linear, quadratic, cubic or neither. Show all work!

a)

x	y
1	10
2	20
3	30
4	40
5	50

+1 → +10; +1 → +10; +1 → +10; +1 → +10

Linear B/C the rates of change are constant on the 1st thg
or
Common 1st difference

b)

x	y
-2	-7
-1	0
0	1
1	2
2	9
3	28

+1 → +7; +1 → +1; +1 → +1; +1 → +7; +1 → +19

+7, −6, +6, +6, +12

Cubic B/C the rate of change are constant a the 3rd thg
or
common 3rd difference

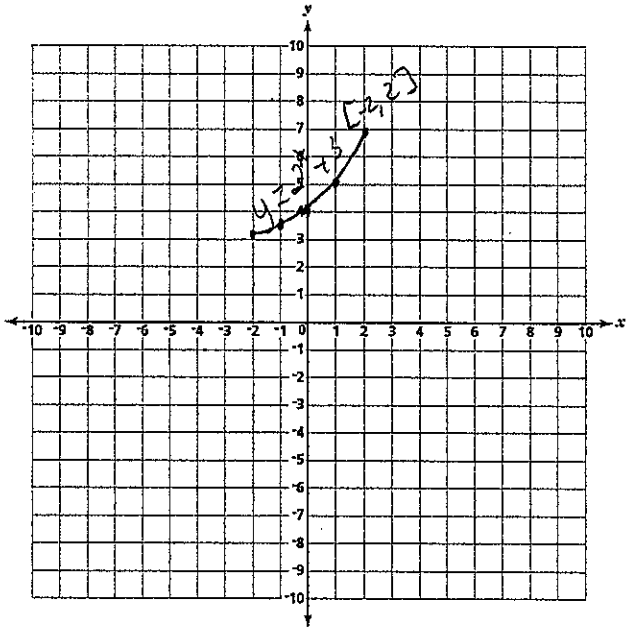
25) (a) Graph $y = 2^x + 3$ on the following coordinate plane over the interval [-2, 2]

translated 3 units up from (0, 1)

x	y
-2	3.25
-1	3.5
0	4
1	5
2	7

grows

and a curve B/C the constraints are given



(b) What is the y-intercept of the function. (0, 4) or $y = 4$

(c) State the domain of the function. $[-2, 2]$ or $\{x \mid -2 \le x \le 2\}$

(d) State the range of the function $[3.25, 7)$ or $\{y \mid 3.25 \le y \le 7\}$