Algebra RH
Unit 16 Check-In (Other Functions)

Types of "Other" Functions

Cubic $f(x) = x^3$

Cube Root $f(x) = \sqrt[3]{x}$

Absolute Value $f(x) = |x|$

Square Root $f(x) = \sqrt{x}$

"The Big 3"

Linear: $y = mx + b$

Exponential: $y = ab^x$

Quadratic: $y = ax^2 + bx + c$

Practice Problem Set

1. Determine if the following tables represent linear, quadratic or exponential functions. Justify using differences or ratios.

A. exponential

common ratio is 3

x	$f(x)$
-1	$\frac{2}{3}$
0	2
1	6
2	18

×3
×3
×3

B. quadratic

common second difference is 4

x	$f(x)$
-3	37
-2	21
-1	9
0	1

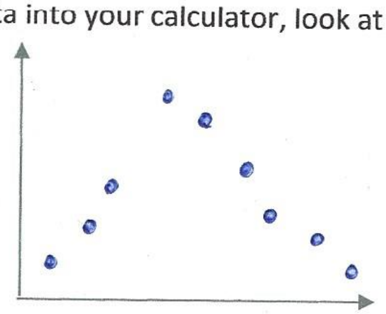
-16
-12
-8
+4
+4

2. The following data was recorded for NY Coronavirus Hospitalizations.

STAT EDIT to enter data

Day	10	15	18	23	28	35	40	45	51
Cases	489	1265	1925	3181	2945	2156	1408	1076	789

a. Enter the data into your calculator, look at the scatter plot and give a quick sketch for the data



go to y =
move up to PLOT
press enter to highlight
then
ZOOM #9

b. Write a regression model that best fits the data. Round all values to the nearest tenth.

circle rounding directions

use the quadratic regression model
(sketch shows increase, then decrease)

a = -5.1
b = 298.8
c = -1811.7

STAT → CALC → #5
then keep pressing enter until a, b, c appear

$y = -5.1x^2 + 298.8x - 1811.7$

3. Solve each equation for x

a. $|4x-1| = x-7$ b. $3\sqrt{x+7}+2 = 17$ c. $(x-7)^2+1 = 10$ d. $\sqrt[3]{x+1} = 2$

a.
$4x-1 = x-7$ or $4x-1 = -x+7$
$3x = -6$ ↓ $5x = 8$
$x = -2$ or $x = \frac{8}{5}$

Both solutions reject, therefore: NO SOLUTION

b.
$3\sqrt{x+7} = 15$
$\sqrt{x+7} = 5$
$(\sqrt{x+7})^2 = 5^2$
$x+7 = 25$
$x = 18$

c.
$(x-7)^2 = 9$
$\sqrt{(x-7)^2} = \pm\sqrt{9}$
$x-7 = \pm 3$
$x = 7 \pm 3$
$x = 7+3, 7-3$
$x = 10, 4$

d.
$(\sqrt[3]{x+1})^3 = 2^3$
$x+1 = 8$
$x = 7$

4. State the domain of the function $f(x) = \sqrt{10-x}$

x values

radicand ≥ 0

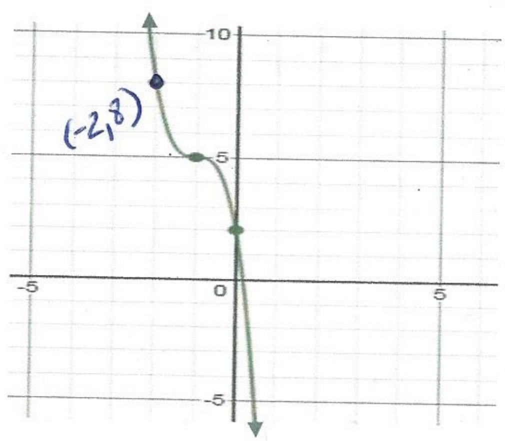
$10 - x \geq 0$
$-x \geq -10$
$x \leq 10$

5. Given the parent function $f(x) = |x|$, describe the transformation to the new equation $g(x) = -\frac{3}{2}|x+9| - 5$

$a = 1.5$ (greater than 1)

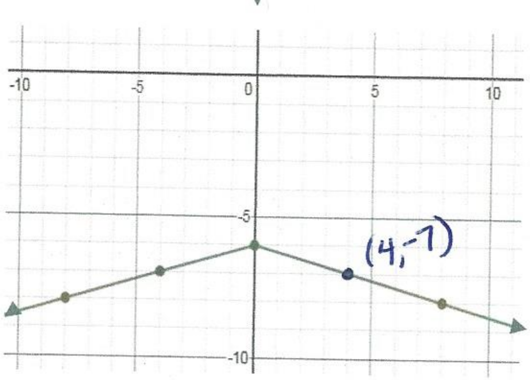
reflection over the x-axis
vertical stretch by a factor of $\frac{3}{2}$
horizontal shift 9 units left
vertical shift 5 units down

6. Write an equation for each graph below.



Equation: $y = -3(x+1)^3 + 5$

parent graph: $y = x^3$
origin point moved 1 to the left and 5 up
$y = a(x+1)^3 + 5$
a point from the graph: $(-2, 8)$
$8 = a(-2+1)^3 + 5$
$8 = -a + 5$
$3 = -a$
$a = -3$



Equation:

$y = -\frac{1}{4}|x| - 6$ ← work to get this equation

$y = a|x| - 6$
I used point $(4, -7)$
$-7 = a|4| - 6$
$-1 = 4a$
$a = -\frac{1}{4}$

check your equation!
- type in the equation
- check the TOV
- make sure the points match the ones on the graph

7. Determine the average rate of change for the function $f(x)=\sqrt[3]{x+8}$ over the interval $-7\leq x\leq 0$.

$$\frac{\Delta y}{\Delta x} = \frac{2-1}{0-(-7)} = \frac{1}{7}$$

x	y
-7	1
0	2

8. Write the equation of a square root function that has been vertically stretched by a factor of 7 and translated 9 units down and 14 units right.

subtract 9 in back

subtract 14 inside the symbol

multiply by 7 in the front

$$y = 7\sqrt{x-14} - 9$$

9. Given the following quadratic function, $g(x) = -3x^2 - 24x + 5$, determine the transformations that were applied to the parent function $f(x) = x^2$

Must put in vertex form first!

$y = -3x^2 - 24x + 5$

$y - 5 = -3x^2 - 24x$

$\left(\frac{8}{2}\right)^2$

$y - 5 - 48 = -3(x^2 + 8x + 16)$

$y - 53 = -3(x+4)^2$

$y = -3(x+4)^2 + 53$

reflection over the x-axis

vertical stretch by a factor of 3

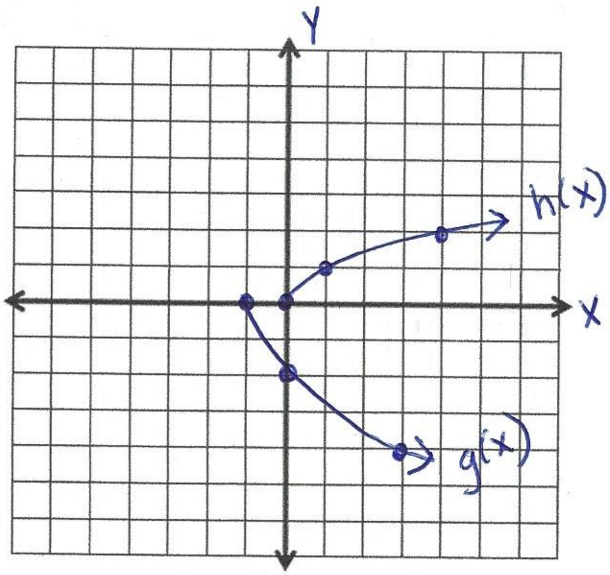
horizontal shift 4 units left

vertical shift 53 units up

10. Graph $g(x)$ and $h(x)$ on each coordinate plane below. State the domain and range of $g(x)$. Describe the transformation of $g(x)$ as compared to the parent function $h(x)$.

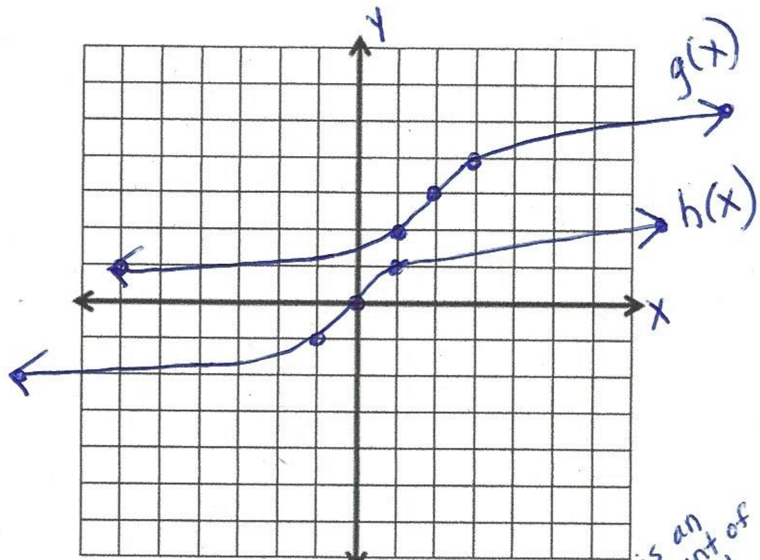
$h(x)=\sqrt{x}$

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



$h(x)=\sqrt[3]{x}$

$g(x) = \sqrt[3]{x-2} + 3$



g(x)

domain: $[-1,\infty)$ $x \geq -1$

range: $(-\infty, 0]$ $y \leq 0$

transformation: reflection over the x-axis
vertical stretch by a factor of 2
horizontal shift 1 unit left

g(x)

domain: $(-\infty,\infty)$ $x \in \mathbb{R}$ x is an element of all real numbers

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

transformation: horizontal shift 2 units right
vertical shift 3 units up

11. Algebraically determine the transformation from $f(x) = x^2 - 10x + 2$ to $g(x) = -x^2 + 4x - 7$

change to vertex form and determine the change

$\boxed{\text{horizontal shift 3 units left} \quad \text{vertical shift 20 units up}}$

$y - 2 = (x^2 - 10x + 25)$
$+25$
$y + 23 = (x-5)^2$
$y = (x-5)^2 - 23$

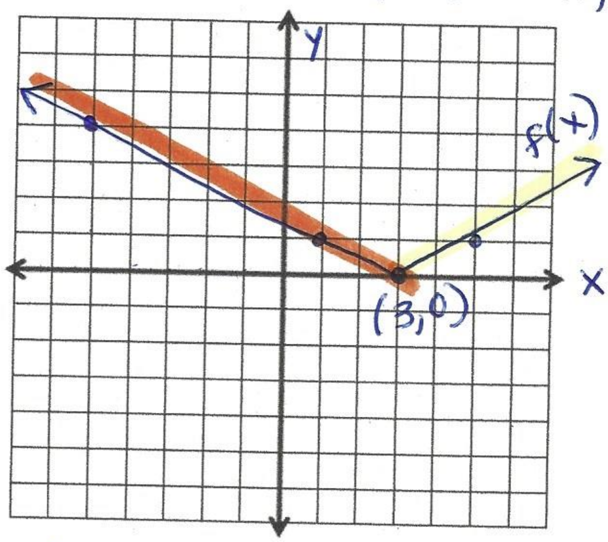
$y + 7 = -x^2 + 4x$
$y + 7 = -1(x^2 - 4x + 4)$
-4
$y + 3 = -1(x-2)^2$
$y = -1(x-2)^2 - 3$

from $(5,-23)$ to $(2,-3)$

12. a. Graph the function $f(x) = \frac{1}{2}|x-3|$.

create a table of values and graph

or sketch the parent absolute value function and show the transformation to each point (y value multiplied by $\frac{1}{2}$, x value adds 3)



x	y
-5	4
1	1
3	0
5	1
7	2
9	3

b. State the domain and range of *f*(x).

domain: $(-\infty, \infty)$ ← interval notation → range: $[0, \infty)$

c. State the interval over which the function is *increasing*. State the interval over which the function is *decreasing*. → x values

look at the x value of the vertex and compare the values of the other x coordinates

increasing: $x > 3$ decreasing: $x < 3$

13. The graph of a transformation of the function $f(x) = x^2$ is shown. The transformation shown can be expressed in the form **$y = p[f(x + r)] + n$**, where **p**, **r** and **n** are constants. Determine the values of each:

p = -2

r = -1

n = 3

you can write the function in vertex form and use a point to help find a

$f(x) = a(x-1)^2 + 3$

use $(0,1)$

$1 = a(0-1)^2 + 3$

$1 = 1a + 3$

$-2 = a$

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