PS6: Functions & Their Graphs (Chapter 1) Review B Name Key Date ______ Period ___

Show your work for full credit.

1) Determine if the relation is a function. If not, explain.

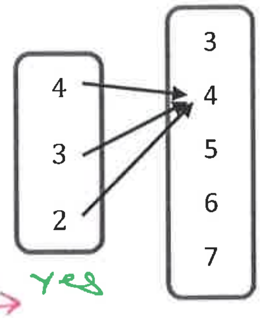
a.

x	3	2	9	1	-2
y	-4	3	-4	7	8

Yes

b. $\{(-1,3),(-7,4),(-\frac{3}{2},1),(\frac{1}{2},3),(-1,1)\}$ No

c.



Yes

2) Determine if the equation represents a function of x. Show your work.

I used this $y \geq 0$

a. $5x + y^2 = 10$, when $x \geq 2$ $\sqrt{y^2} = \sqrt{10-5x}$ $y = \sqrt{10-5x}$ yes.

← less than zero

b. $x^3 - y^3 = 3$ $-x^3$ $-x^3$ $-y^3 = 3 - x^3$ $\sqrt[3]{y^3} = \sqrt[3]{x^3-3} = \sqrt[3]{x^3-3}$ yes.

c. $\frac{2y^2}{2} = \frac{2x^2}{2} - \frac{8}{2}$ $\pm\sqrt{y^2} = \sqrt{x^2-4}$ $y = \pm\sqrt{x^2-4}$ No.

3) Evaluation the function as indicated. $f(x) = 4x - 7$

a. $f(-5) = -20 - 7 = \boxed{-27}$

b. $f(v-1) = 4(v-1) - 7 = \boxed{4v-11}$

c. $\frac{f(x+h)-f(x)}{h} = \frac{4(x+h)-7-(4x-7)}{h} = \frac{\cancel{4x}+4h\cancel{-7}\cancel{-4x}\cancel{+7}}{h} = \frac{4h}{h} = \boxed{4}$

4) Evaluation the function as indicated. $h(x) = \frac{x}{x+2}$

a. $h(22) = \frac{22}{24} = \boxed{\frac{11}{12}}$

b. $h(t^2-2) = \frac{t^2-2}{t^2} = \boxed{1 - \frac{2}{t^2}}$

d. $\frac{h(2)}{h(v)}$ $\frac{\frac{1}{2}}{\frac{v}{v+2}} = \frac{1}{2} \cdot \frac{v+2}{v} = \frac{v+2}{2v} = \boxed{\frac{1}{2} + \frac{1}{v}}$

5) Find the domain of the functions. Graph the function using a GDC to verify your answer. (don't need to graph by hand) (Use interval notation)

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

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

b. $f(x) = \frac{4}{x^2-4}$ D: $(-\infty,-2)(-2,2)(2,\infty)$

c. $f(x) = \sqrt{x-1}$ D: $[1,\infty)$

d. $f(x) = \frac{1}{\sqrt{2x-3}}$ $\sqrt{\ }$ $2x-3 \geq 0$

$x \geq \frac{3}{2}$

$x \neq \frac{3}{2}$, D: $(\frac{3}{2}, \infty)$

6) Find the domain and range of the functions. Use a graph to help you find the range.

a. $f(x) = 2^x$ $D: (-\infty, \infty)$ $\mathbb{R}$ $R: (0, \infty)$, $y > 0$

b. $f(x) = -\sqrt{3-x}$ $D: (-\infty, 3]$ $R: y \leq 0$

c. $f(x) = -\frac{1}{2}|x-7| + 2$ $D: (-\infty, \infty)$ $R: y \leq 2$

7) Graph the equation using a GDC and use the vertical line test to decide if it is a function. State the domain and range if it is a function. Make a quick sketch of the graph (no need to plot points).

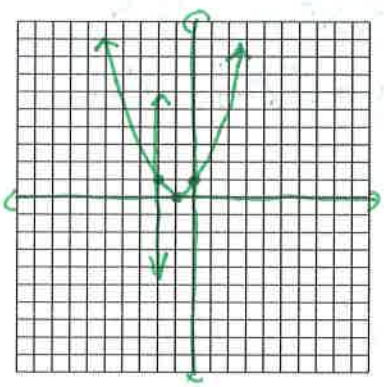
a. $y = x^2 + 2x + 1$

$y = (x+1)^2$

Function = yes!

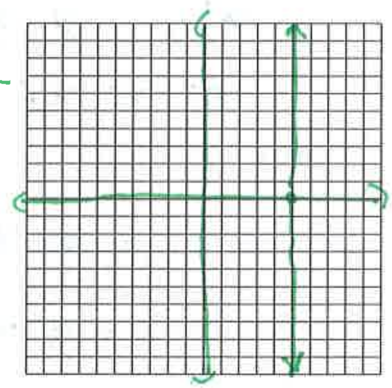
$D: (-\infty, \infty)$

$R: y \geq 0$



c. $x = 5$

Not a function

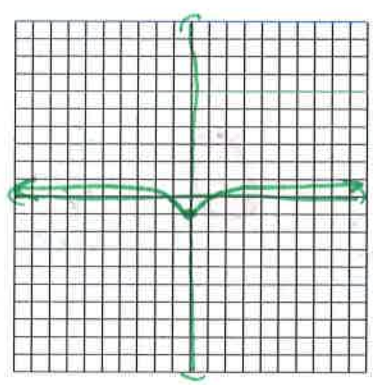


b. $y = \frac{x^2-1}{x^2+1}$

Yes = Function!

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

$R: -1 \leq y \leq 1$



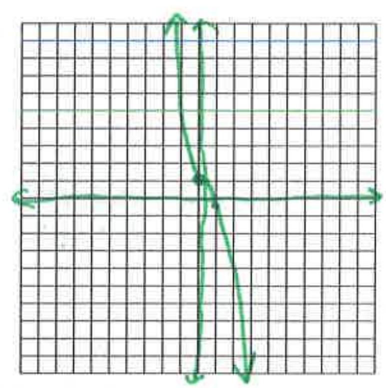
e. $2x + \sqrt[3]{y} = 1$

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

Function = yes!

$D: \mathbb{R}$

$R: \mathbb{R}$



8) Determine a) what interval the function is increasing, decreasing or constant, b) if the function is odd, even or neither c) and if there are any local maximum or minimum values. Make a quick sketch of the graph.

a. $h(x) = x^3 - 3x - 1$

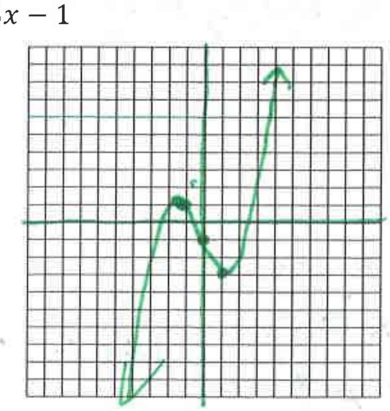
max: $(-1, 1)$

min: $(1, -3)$

Inc: $(-\infty, -1) \cup (1, \infty)$

Dec: $(-1, 1)$

Neither



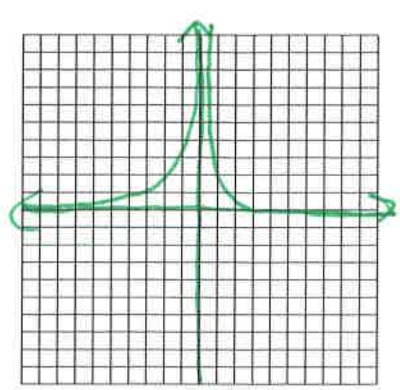
c. $f(x) = \frac{1}{x^2}$

No min, max

inc: $(-\infty, 0)$

Dec: $(0, \infty)$

Even function



9) Determine a) what interval the function is increasing, decreasing or constant, b) if the function is odd, even or neither c) and if there are any local maximum or minimum values. Make a quick sketch of the graph.

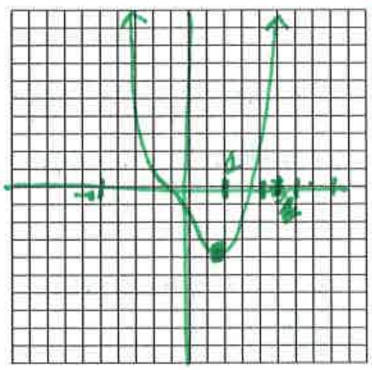
a. $f(x) = x^4 - 3x - 1$

min: $(.909, -3.044)$

inc: $(.909, \infty)$

dec: $(-\infty, .909)$

Neither

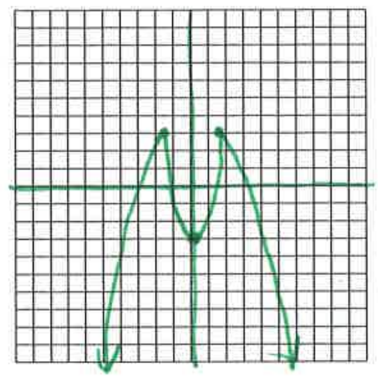


by 2's.

c. $f(x) = -3|x^2 - 2| + 3$

max: $(-\sqrt{2}, 3)$ $(\sqrt{2}, 3)$ $-1.41 = \sqrt{2}$

min: $(0, -3)$



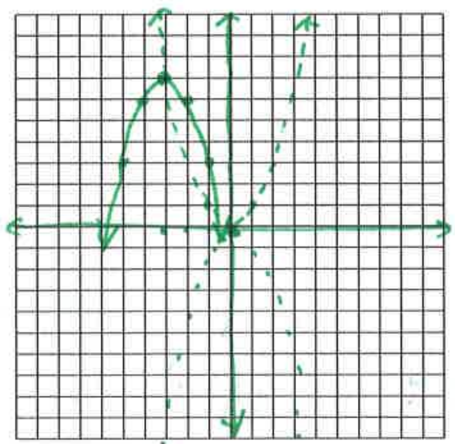
inc: $(-\infty, -\sqrt{2})(0, \sqrt{2})$

dec: $(-\sqrt{2}, 0)(\sqrt{2}, \infty)$

10) Sketch the graph by hand and name the transformations and the base graph.

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

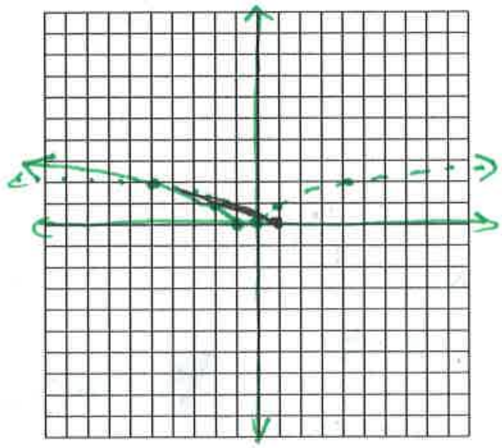
base $= x^2$



b. $f(x) = \sqrt{1-x}$

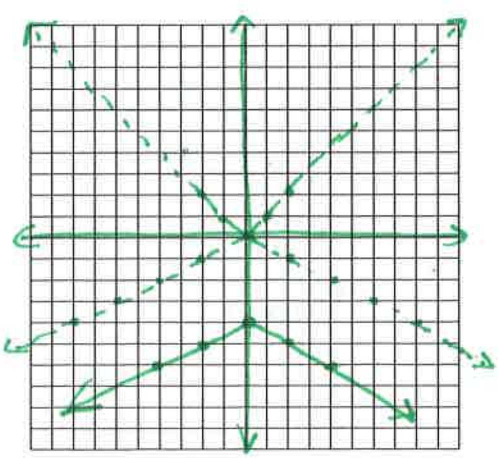
$= \sqrt{-x+1}$

base $= \sqrt{x}$



c. $f(x) = -\frac{1}{2}|x| - 4$

base $= |x|$

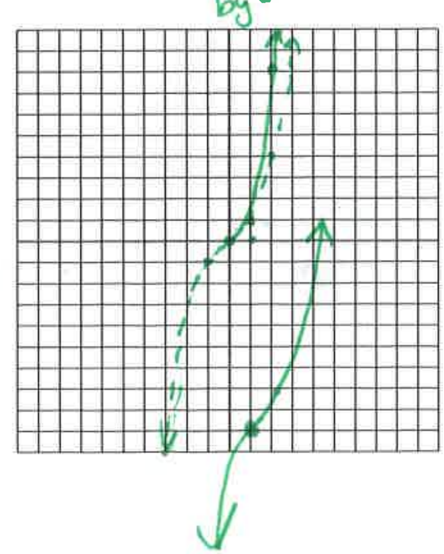


e. $f(x) = 6(x-1)^3 - 9$

smaller

base $= x^3$

by 6's



by 6's

11) Let $f(x) = x^2 - 4x + 3$, $g(x) = \frac{1}{x}$ and $h(x) = x - 3$. Find and state the domain of:

a. $(f - h)(x)$

$f(x) - h(x) = x^2 - 4x + 3 - x + 3$

$= \boxed{x^2 - 5x + 6}$

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

b. $(hg)(x)$

$\frac{x-3}{x} = \boxed{1 - \frac{3}{x}}$

D: $\mathbb{R}, x \neq 0$

or

$(-\infty, 0)(0, \infty)$

c. $\left(\frac{h}{f}\right)(x)$

$\frac{x-3}{x^2-4x+3} = \frac{\cancel{(x-3)}}{\cancel{(x-3)}(x-1)}$

$= \boxed{\frac{1}{x-1}}$

D: $(-\infty, 1)(1, 3)(3, \infty)$

$\mathbb{R}, x \neq 1, 3$

d. $(g \circ g)(x)$

$\frac{1}{\left(\frac{1}{x}\right)} = \boxed{\frac{1}{x}}$

D: $\mathbb{R}, x \neq 0$

$(-\infty, 0)(0, \infty)$

e. $g(f(x)) = \boxed{\frac{1}{x^2-4x+3}}$

$D = \mathbb{R}, x \neq 1, 3$

$(-\infty, 1)(1, 3)(3, \infty)$

f. find $h(f(3))$ (no need for domain)

$f(3) = 9 - 12 + 3$

$f(3) = 0$

$h(0) = 0 - 3$

$h(0) = -3$

$\boxed{h(f(3)) = -3}$

12) Decide if the function is one-to-one by using the horizontal line test. If f^{-1} exists, find it **Algebraically** and graph it along with f and $y = x$.

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

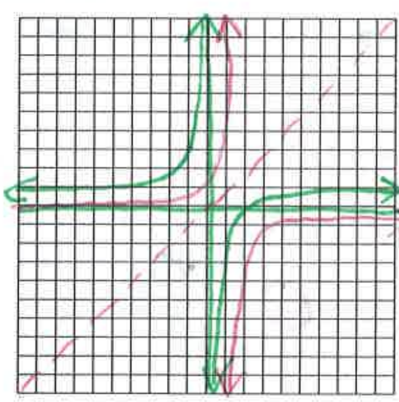
$x = 1 - \frac{1}{y}$

$x - 1 = -\frac{1}{y}$

$1 - x = \frac{1}{y}$

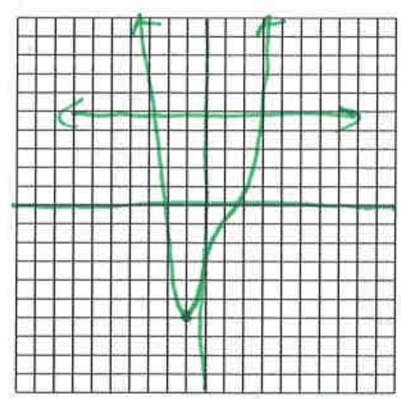
$y = \frac{1}{1-x}$

Passes H.L.T



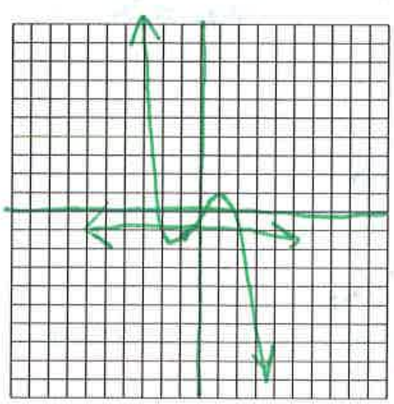
b. $f(x) = x^4 + 5x - 2$

fail H.L.T.



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

fail H.L.T.



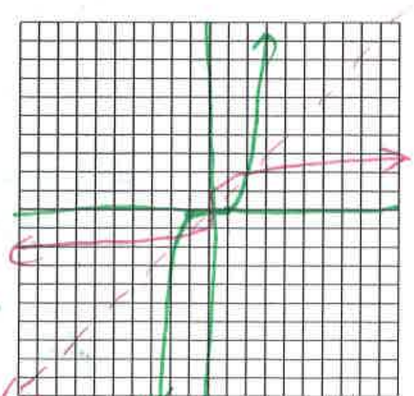
d. $f(x) = \frac{1}{5}x^5$

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

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

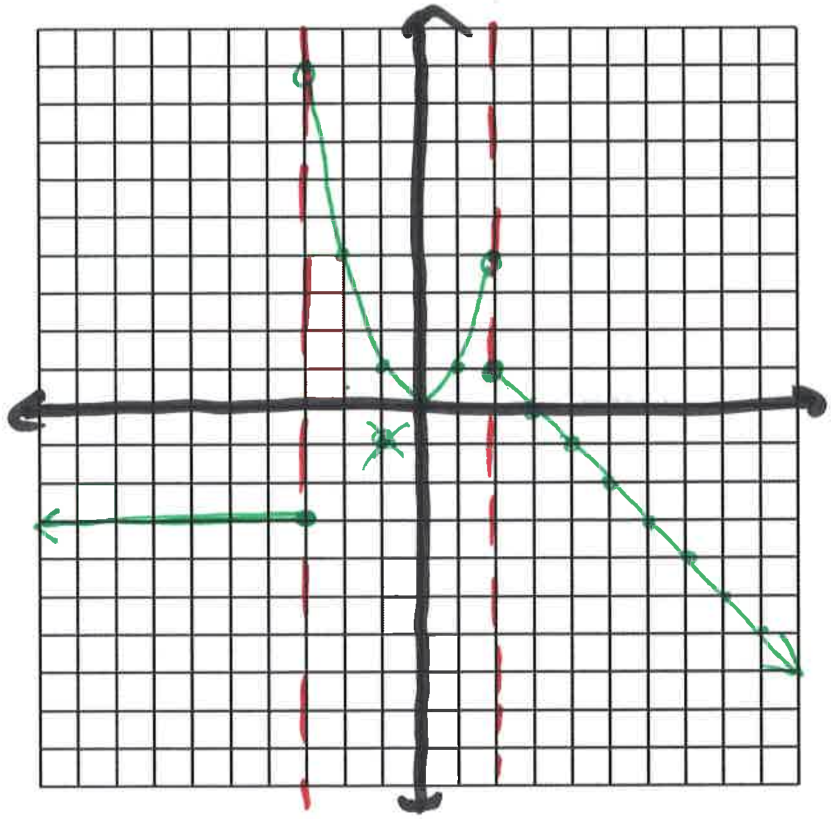
$5x = y^5$

$\sqrt[5]{5x} = y$



13)

a) Graph the piece-wise function.



$$f(x) = \begin{cases} -3, & x \le -3 \\ x^2, & -3 < x < 2 \\ -x+3, & x \ge 2 \end{cases}$$

b) What is $f(-4)$?

$f(-4) = \boxed{-3}$

c) What does $f(2) + f(-2) =$

$f(2) = 1$

$f(-2) = 4$

$1 + 4 = \boxed{5}$