Name: MR. YOUNG - Rubric Date: Prd: 1/2/3

Review for the Chapter 2 Test: Functions

Honors Precalculus

Directions: work in groups of 4 to complete the following problems. Call me over if you come across any particular questions. The test will be almost entirely on Chapter 2 material, but there will be a review problem or two from Chapter 1 (similar to the chapter 1 questions from the quiz).

Chapter 1 Review:

(#1-2) Solve for x on each equation below.

$2x^4 - 7x^2 + 6 = 0$

$u = x^2$

$2u^2 - 7u + 6 = 0$

$(2u - 3)(u - 2) = 0$

$\frac{2x^2}{2} = \frac{3}{2}$ $x^2 = 2$

$\boxed{x = \pm\sqrt{2}}$

$\sqrt{x^2} = \sqrt{\frac{3}{2}}$

$\boxed{x = \pm\sqrt{\frac{3}{2}}}$

$\left(\sqrt{3 - \sqrt{x+5}}\right)^2 = 2$

$3 - \sqrt{x+5} = 2$
$-3 \qquad -3$

$\frac{-\sqrt{x+5}}{-1} = \frac{-1}{-1}$

$(\sqrt{x+5})^2 = (1)^2$

$x + 5 = 1$
$-5 \quad -5$

$\boxed{\cancel{x = -4}}$

Extraneous.

$\boxed{\text{No solution}}$

Check:

$\sqrt{3 - \sqrt{-4+5}}$

$\sqrt{3 - \sqrt{1}}$

$\sqrt{3-1}$

$\sqrt{2} \neq 2$

Extraneous.

Chapter 2 Review:

#3)

Determine the average rate of change for the function $f(t) = t^2 - 2t$ between $t = 2$ and $t = 5$.

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

$\frac{15 - 0}{3} = \boxed{5}$

b.) Then find the average rate of change between t = a and t = a + h

$x_1 \qquad x_2$

$$\frac{(a+h)^2 - 2(a+h) - (a^2 - 2a)}{}$$

$$\frac{\cancel{a^2} + 2ah + h^2 \cancel{-2a} - 2h \cancel{-a^2} \cancel{+2a}}{a + h - a} = \frac{2a\cancel{h} + h^{\cancel{2}} - 2\cancel{h}}{\cancel{h}}$$

$\boxed{2a + h - 2}$

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4.)
If $f(x) = x^2 + 1$ and $g(x) = x - 3$, find the following.

(a) $f \circ g$ **(b)** $g \circ f$

(c) $f(g(2))$ **(d)** $g(f(2))$

(e) $g \circ g \circ g$

d.) $g(f(2)) = 2^2 - 2$
$= \boxed{2}$

e.) $g \circ g \circ g = (x-3-3)-3$
$= x-3-3-3$
$= \boxed{x-9}$

a.) $f \circ g = (x-3)^2+1$
$= x^2-6x+9+1$
$= \boxed{x^2-6x+10}$

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

c.) $f(g(2)) = 2^2-6(2)+10$
$= 4-12+10$
$= \boxed{2}$

5.) *Function Decomposition:*
Let $f(x) = 9x$ $g(x) = \sqrt{4x+8}$ $h(x) = 4x^2$ $t(x) = 2x - 5$
Express each function below k(x) as a composition of 3 out of 4 of the functions above.

a.) $k(x) = \sqrt{144x^2 + 8}$

$\boxed{g(f(h(x)))} = \sqrt{4(9x)+8}$

OR $\sqrt{36x+8}$

$\boxed{g(h(f(x)))}$ $\sqrt{36(4x^2)+8}$ ← works!
$\sqrt{144x^2+8}$

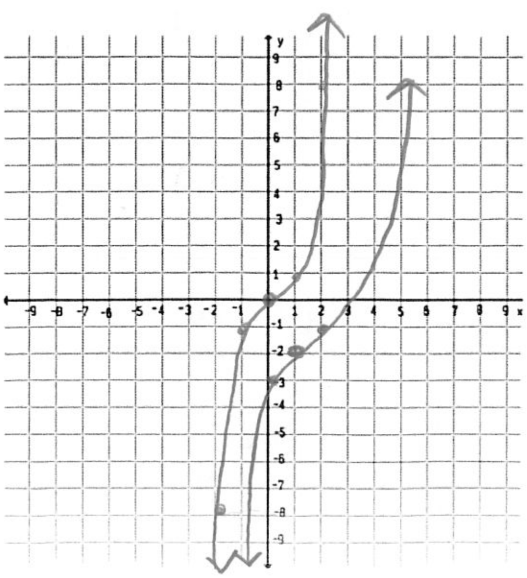
* This works too.

b.) $k(x) = \cancel{72x^2 - 360x + 450}$
$144x^2 - 720x + 900$

$\boxed{f(h(t(x)))} = 9(4(2x-5)^2)$
$9(4(4x^2-20x+25))$ works!
$= 36(4x^2-20x+25)$ ↓
$144x^2-80x+900$

5.) Sketch a graph of the function **and** parent function below without a calculator. Write the transformations in words and then state the domain and range. Be sure that at least one point is in the correct location (also note any asymptotes on your graph with dotted lines).

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



Transformations in Words

Down 2
Right 1

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

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

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INVERSES:

6.)

(a) If $f(x) = \sqrt{3 - x}$, find the inverse function f^{-1}.

(b) Sketch the graphs of f and f^{-1} on the same coordinate axes.

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

$(x)^2 = \left(\sqrt{3 - y}\right)^2$

$x^2 = 3 - y$

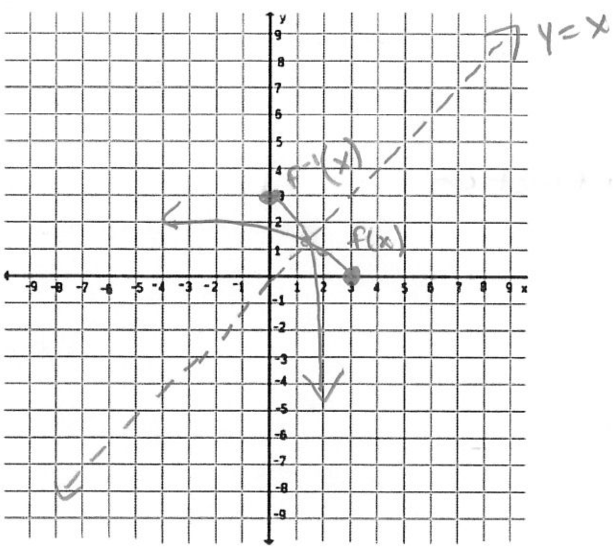
$-3 \quad -3$

$\dfrac{x^2 - 3}{-1} = \dfrac{-y}{-1}$

$-x^2 + 3 = y$

$\boxed{f^{-1}(x) = -x^2 + 3}$

$\boxed{D: [0, \infty)}$



* NOTE: You must state the domain restriction to show that you only graph half of the parabola.

Remember the domain of the function becomes the range of the inverse and the range of the function is the domain of the inverse.

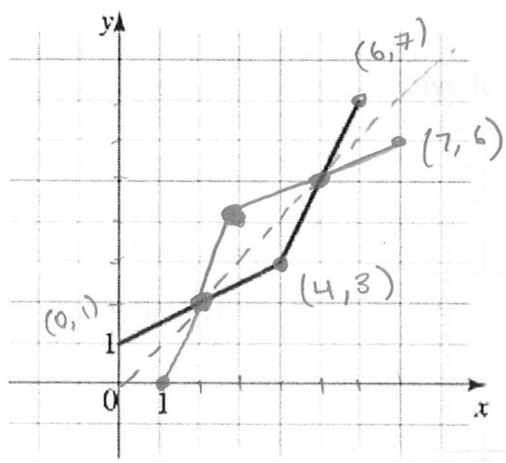
6.)

The graph of a function f is given.

(a) Find the domain and range of f.

(b) Sketch the graph of f^{-1}.

(c) Find the average rate of change of f between $x = 2$ and $x = 6$.



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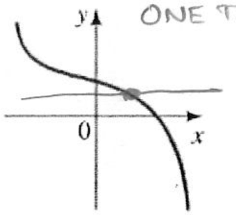
7.)

Which of the following are graphs of functions? If the graph is that of a function, is it one-to-one?

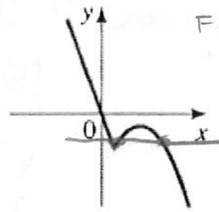
(a)

function and
ONE TO ONE



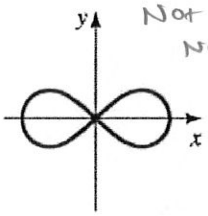
(b)

Function
Not one to one



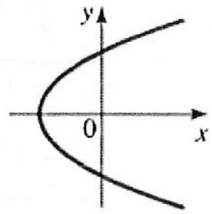
(c)

Not a function
Not one to one



(d)

Not a function



8.) Let $f(x) = \begin{cases} x^2 + 1 & for\ x \leq 2 \\ 2x - 4 & for\ x > 2 \end{cases}$

a.) Evaluate f(0) and f(4)

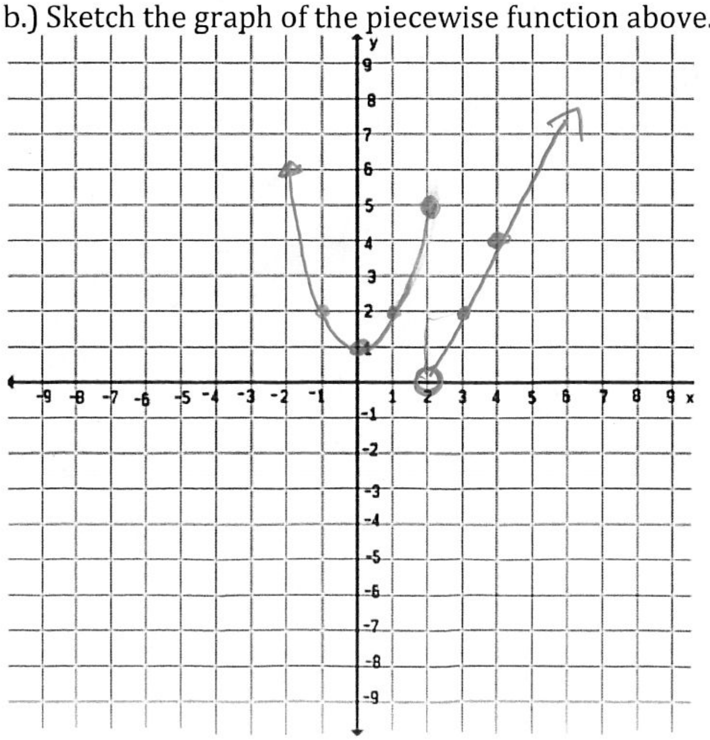
$f(0) = (0)^2 + 1$

$\boxed{f(0) = 1}$

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

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

b.) Sketch the graph of the piecewise function above.



$2^2 + 1$

$2(2) - 4$

$4 - 4 = 0$

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9.) Let $f(x) = 2x^4 - 10x^2 - 5$. Note: Part a is just a sketch on the graph below.

(a) Draw the graph of f in an appropriate viewing rectangle.

(b) Is f one-to-one?

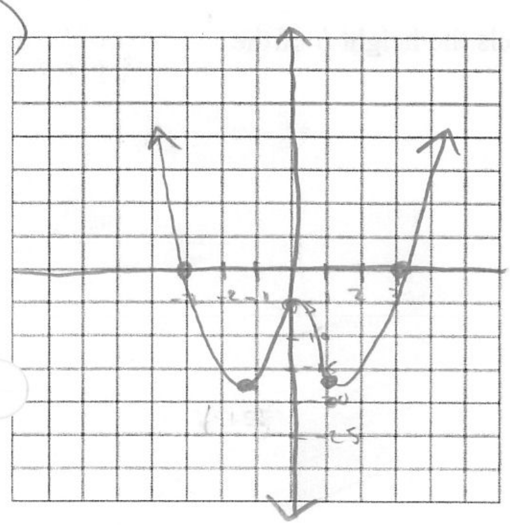
(c) Find the local maximum and minimum values of f and the values of x at which they occur. State each answer correct to two decimal places.

(d) Use the graph to determine the range of f.

(e) Find the intervals on which f is increasing and on which f is decreasing.

f.) Is the function even, odd, or neither.

a.)



b.) $\boxed{\text{No}}$ fails horiz. line test

c.) Local mins: $(-1.58, -17.5)$ $(1.58, -17.5)$

Local max: $(0, -5)$

$\boxed{\text{d.) R: } [-17.5, \infty)}$

e.) Increasing: $[-1.58, 0] \cup [1.58, \infty)$

Decr.: $(-\infty, -1.58] \cup [0, 1.58]$

F.) $f(-x) = 2(-x)^4 - 10(-x)^2 - 5$

$= 2x^4 - 10x^2 - 5$

$f(-x) = f(x)$

$\boxed{\text{Even}}$

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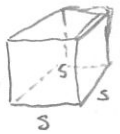
Function Modeling.

10.) Find a function that models the surface area S of a cube as function of its volume.

$V = s^3$

$SA = 6s^2$

s = side of the square



$\sqrt[3]{V} = \sqrt[3]{s^3}$

$s = \sqrt[3]{V}$

$\boxed{SA = 6\left(\sqrt[3]{V}\right)^2}$ either is fine.

$\boxed{SA(V) = 6V^{2/3}}$

11.)

Height The volume of a cone is 100 in³. Find a function that models the height h of the cone in terms of its radius r.

volume of a cone

$V = \frac{1}{3}\pi r^2 h$

$3 \cdot 100 = \cancel{\frac{1}{3}}\pi r^2 h \cdot \cancel{3}$

$\frac{300}{\pi r^2} = \frac{\cancel{\pi r^2} h}{\cancel{\pi r^2}}$

$\boxed{h(r) = \frac{300}{\pi r^2}}$

C = cost

12.) CHALLENGE!

23. Fencing a Garden Plot A property owner wants to fence a garden plot adjacent to a road, as shown in the figure. The fencing next to the road must be sturdier and costs \$5 per foot, but the other fencing costs just \$3 per foot. The garden is to have an area of 1200 ft².

(a) Find a function that models the cost of fencing the garden.

(b) Find the garden dimensions that minimize the cost of fencing.

(c) If the owner has at most \$600 to spend on fencing, find the range of lengths he can fence along the road.

a.) $x \cdot y = 1200$ given

$C = 5x + 3x + 6y$

$C = 8x + 6y$

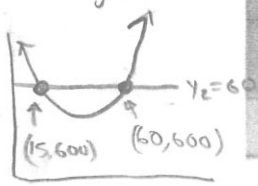
$\frac{x \cdot y}{x} = \frac{1200}{x}$

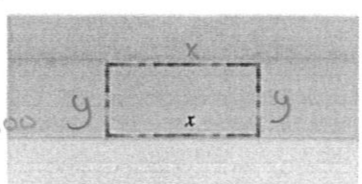
$y = \frac{1200}{x}$

$C = 8x + 6\left(\frac{1200}{x}\right)$

$\boxed{C = 8x + \frac{7200}{x}}$

c.) Graph the function and $y_2 = 600$





Find the intersection points

$\boxed{15 < x < 60}$ The part of the fence along the road must be between ~

b.) Graph the function

min

(30ft, 480)

$\boxed{\text{Dimensions: } 30\text{ft} \times 40\text{ft}}$