Analyzing Functions
Chap 2.2 and 2.3

Name: _____
PC II and DM

For each of the functions graphed, indicate the following using interval notation:

1. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

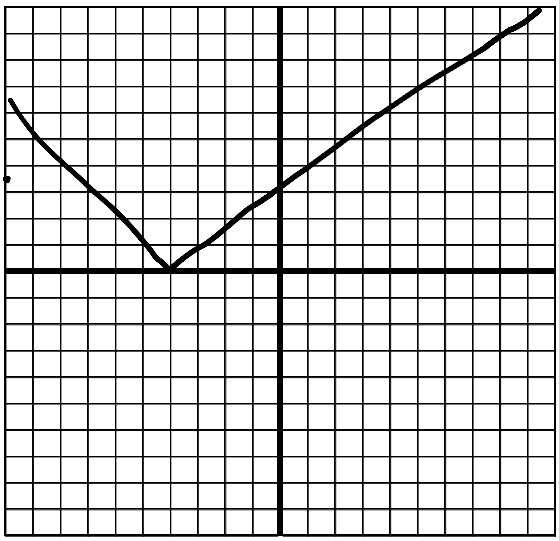
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



2. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

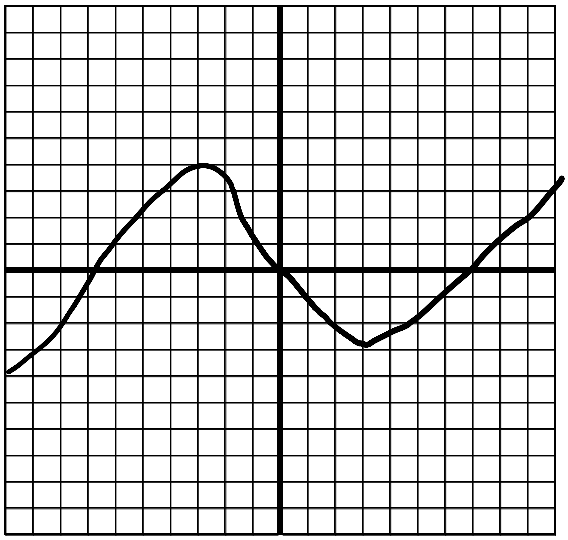
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



3. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

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h. relative maximum _____

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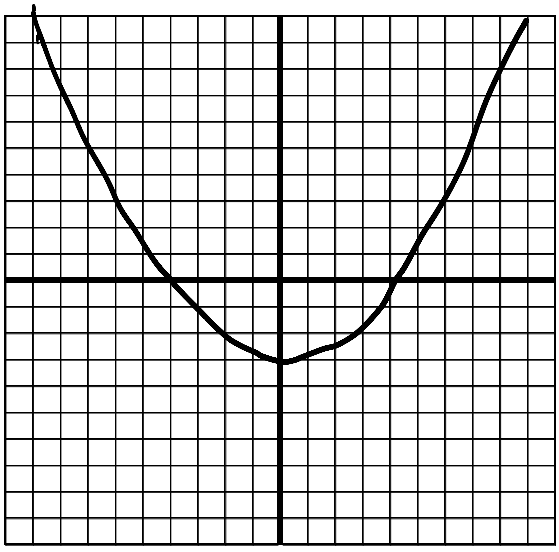
k. absolute minimum _____



4. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

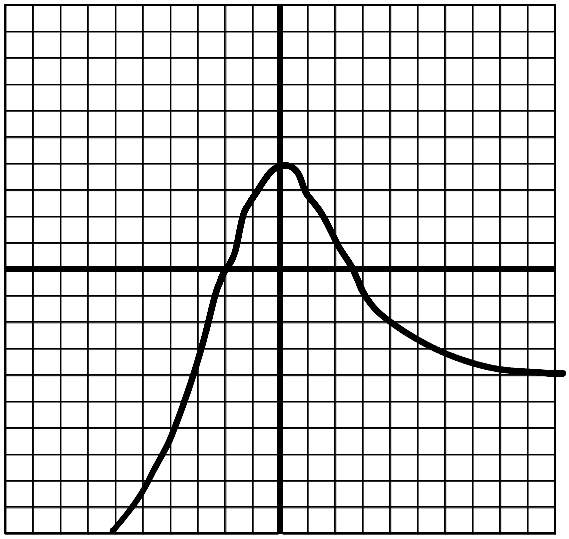
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



5. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

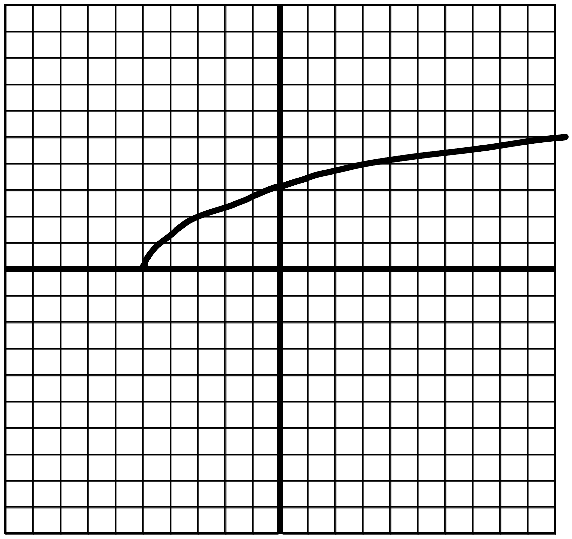
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



6. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

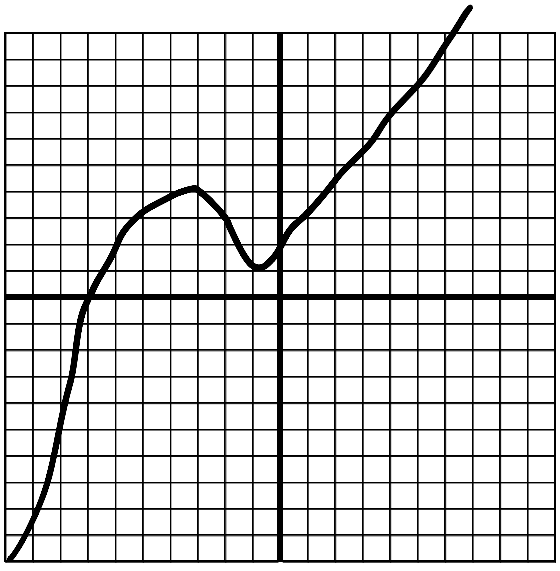
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



7. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

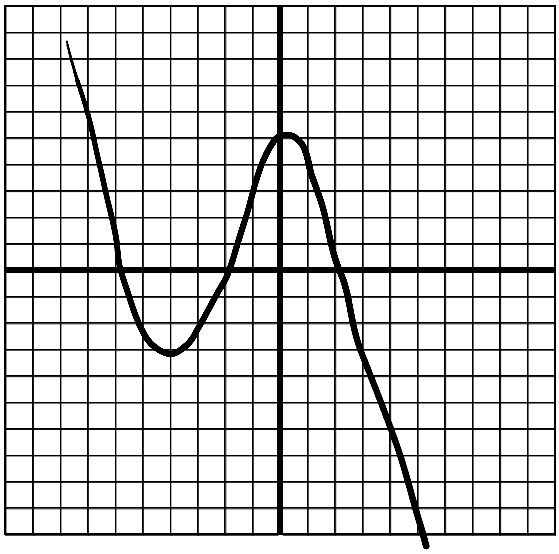
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



8. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

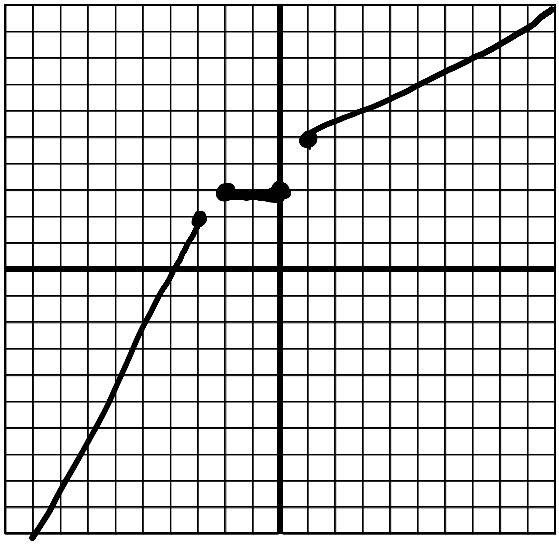
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



9. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

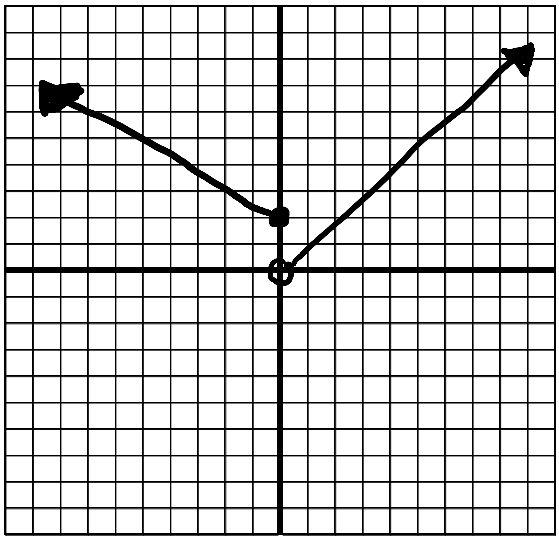
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



10. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

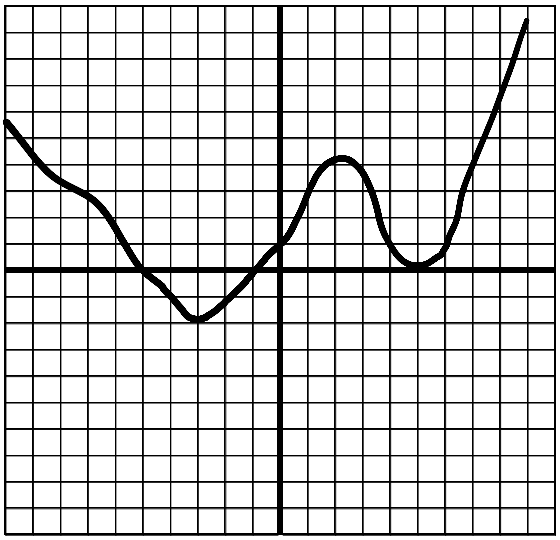
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



11. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

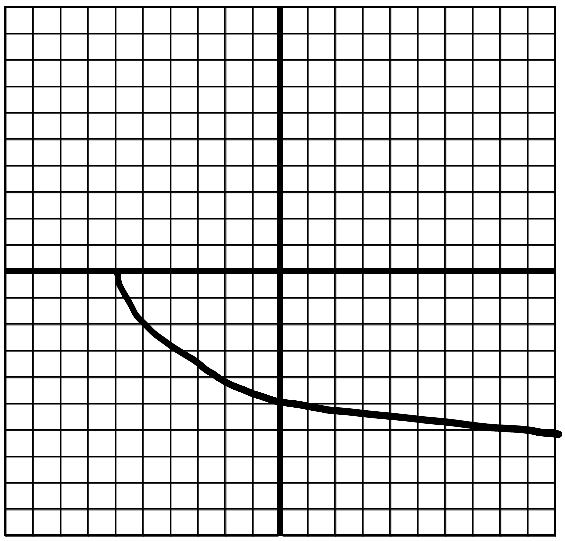
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



12. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

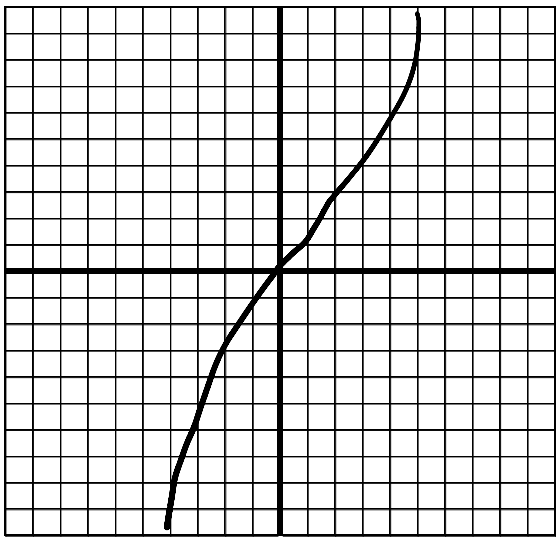
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



13. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

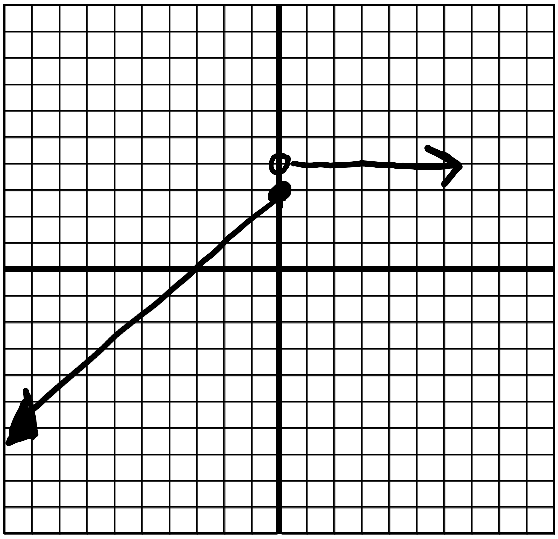
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



14. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

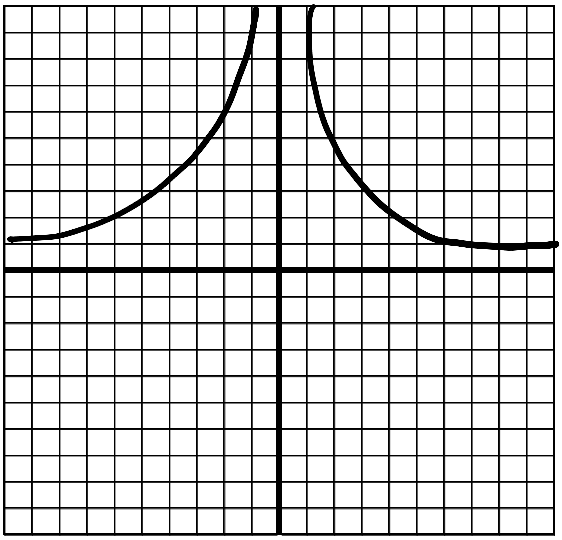
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



15. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

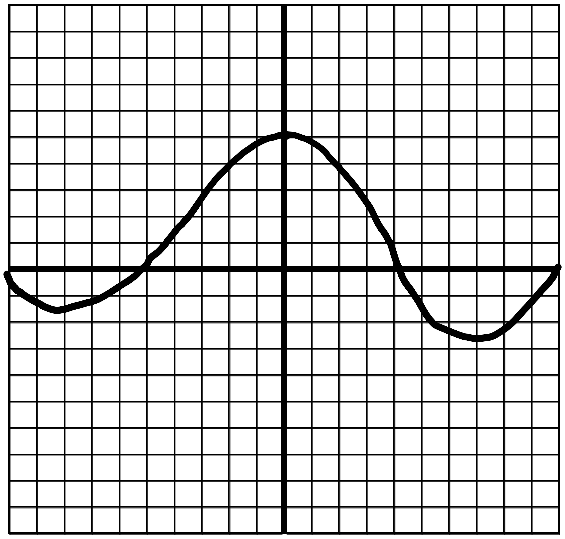
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



16. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

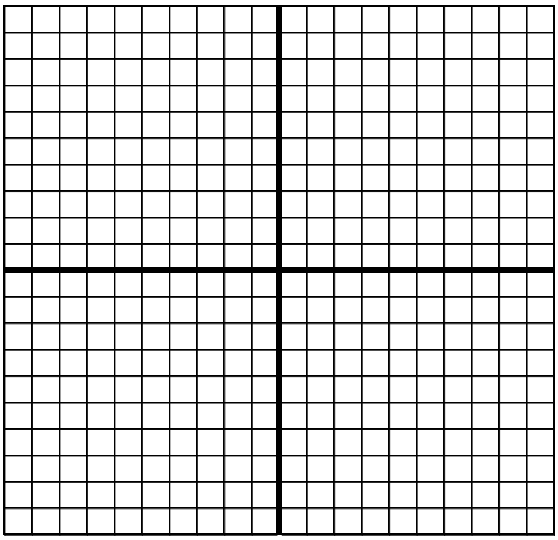
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



17. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

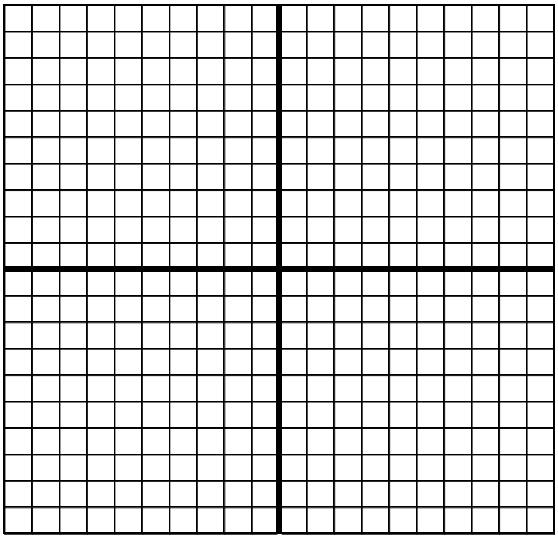
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



18. a. Domain_____b. Range_____

c. Increasing on _____

d. Decreasing on _____

e. f(x) > 0 _____f. f(x) < 0 _____

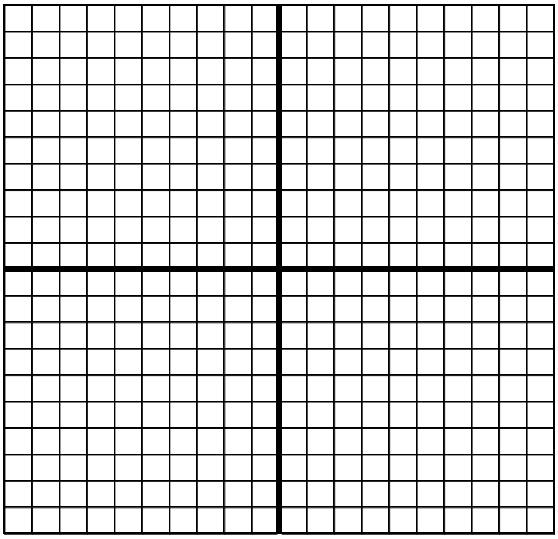
g. f(x) = 0 _____

h. relative maximum _____

i. relative minimum _____

j. absolute maximum _____

k. absolute minimum _____



2.2 / 2.3 (part 2): Piecewise Functions Pre Calc II

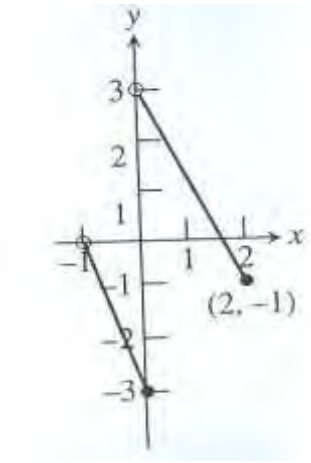
EX 1: Graph the following function:

$$f(x)=\begin{cases}-x+2 & x\le 0\\ x & x>0\end{cases}$$

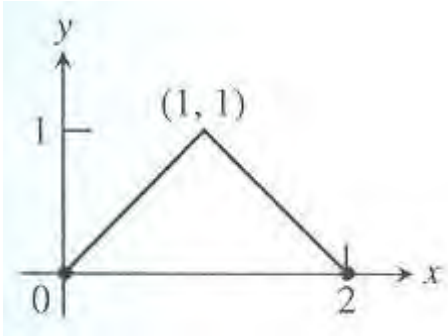
EX 2: Graph

$$g(x)=\begin{cases}-2 & x<-2\\ x & -2\le x\le 0\\ x^2 & 0<x<2\\ 4 & x\ge 2\end{cases}$$

EX 3: Write a function for the graph:



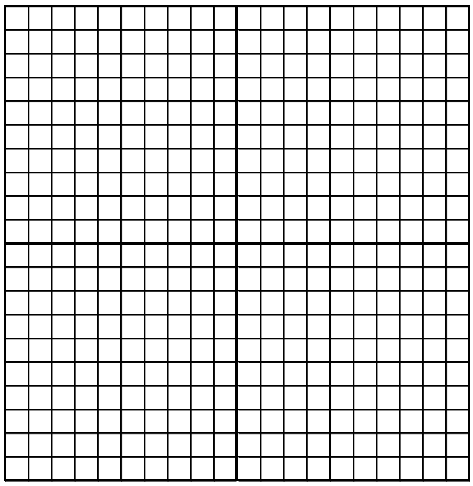
EX 4: Write a function for the graph



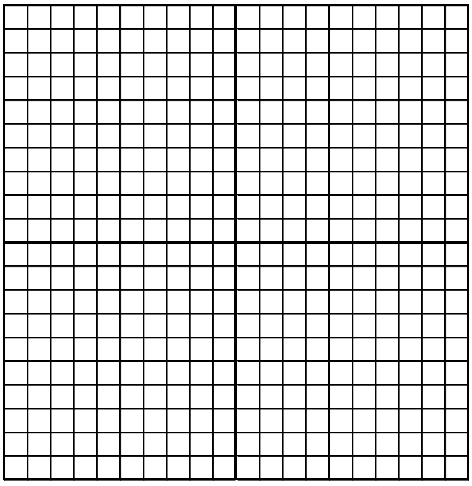
2.2 & 2.3 (pt 2) **Piecewise Function WS** Pre Calc II

I. Graph each of the piecewise functions:

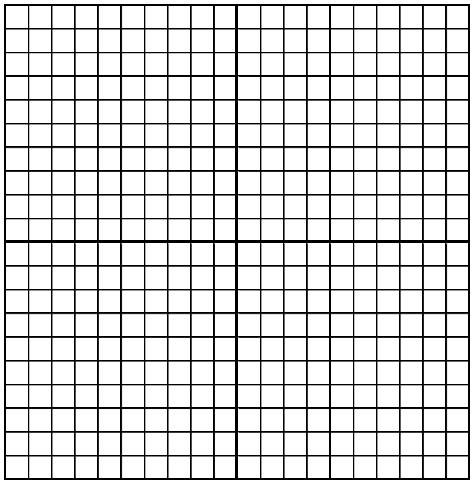
1. $f(x)=\begin{cases}0 & x<2\\ 1 & x\geq 2\end{cases}$



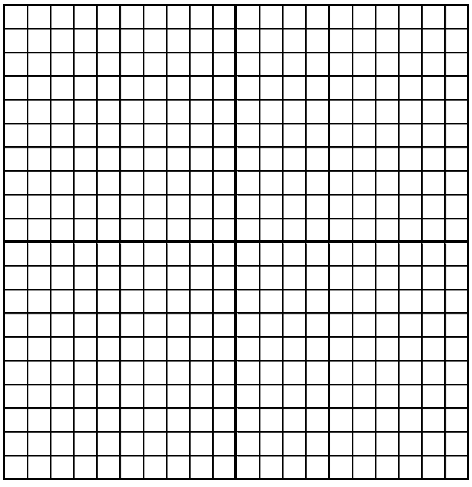
2. $g(x)=\begin{cases}3 & x<2\\ x-1 & x\geq 2\end{cases}$



3. $f(x)=\begin{cases}-1 & x<-1\\ 1 & -1\leq x\leq 1\\ -1 & x>1\end{cases}$



4. $p(x)=\begin{cases}2 & x\leq -1\\ x^2 & x>-1\end{cases}$



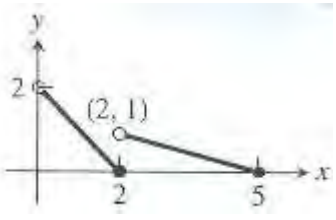
5. $f(x)=\begin{cases}4 & x<-2\\ x^2 & -2\le x\le 2\\ 6-x & x>2\end{cases}$

6. $m(x)=\begin{cases}-x & x\le 0\\ 9-x^2 & 0<x\le 3\\ x-3 & x>3\end{cases}$

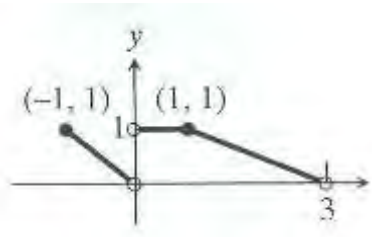
7. $y(x)=\begin{cases}x+2 & x\le -1\\ x^2 & x>-1\end{cases}$

Give an equation for the graph of the piecewise function graphed below:

8.



9.



Optimization WS Section 2.2 Pre Calc II

Solve the following. Show all work.

1. The sum of two nonnegative numbers is 20. Find the numbers if:
(a) the sum of their squares is as large as possible
(b) the sum of their squares is as low as possible.

2. What is the largest possible area for a right triangle who hypotenuse is 5 cm. long and what are its dimensions? (Hint: call the two legs x and y. Use the Pythagorean Theorem to solve for y. Use the formula for area of a triangle to finish the problem).

3. What is the smallest perimeter possible for a rectangle whose area is 16 in^2 and what are its dimensions?

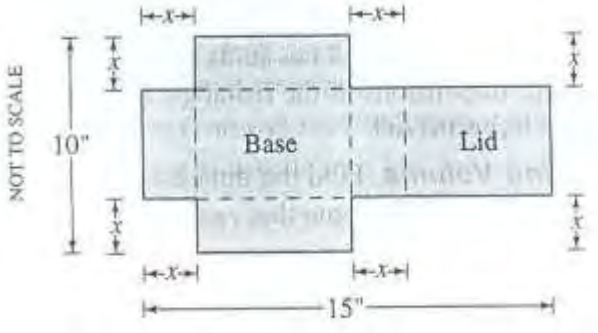
4. You are planning to make an open rectangular box from an 8 inch by 15 inch piece of cardboard by cutting congruent squares from the corners and folding up the sides. What are the dimensions of the box of largest volume you can make this way and what is its volume?

5. A rectangular plot of farmland will be bounded on one side by a river and on the other three sides by a single strand electric fence. With 800m of wire at your disposal, what is the largest area you can enclose and what are its dimensions?

6. A 216 m^2 rectangular pea patch is to be enclosed by a fence and divided into two equal parts by another fence parallel to one of the sides. What dimensions for the outer rectangle will require the smallest total length of fence? How much fence will be needed?

7. What are the dimensions of the lightest <u>open top</u> right circular cylindrical can that will hold a volume of 1000 cm^3?

8. A piece of cardboard measures 10 by 15 inches. Two equal squares are removed from the corners of a 10 inch side as shown in the figure. Two equal rectangles are removed from the other corners so that the tabs can be folded to form a rectangular box with a lid.



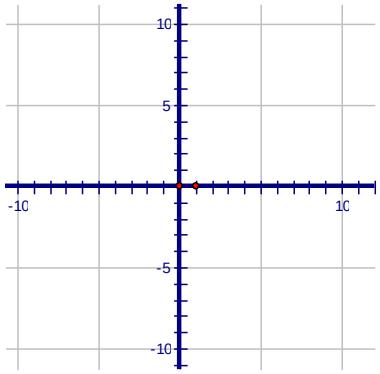
(a) Write a formula V(x) for the volume of the box.
(b) Find the domain of V for this problem and graph V over this domain.
(c) Find the maximum volume and the value of x that gives it.

Pre-Calculus II

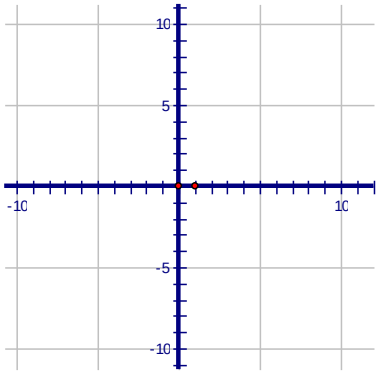
2.5: Parametric Equations Worksheet

1. Sketch the following parametric equations over the given domain. Make sure to show direction. You may use your calculator.

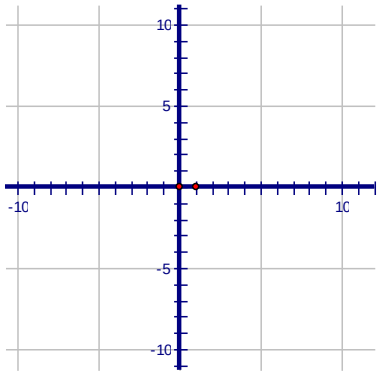
a. $\begin{cases} x = 3t \\ y = 5t - 1 \end{cases}, 0 \le t \le 1$



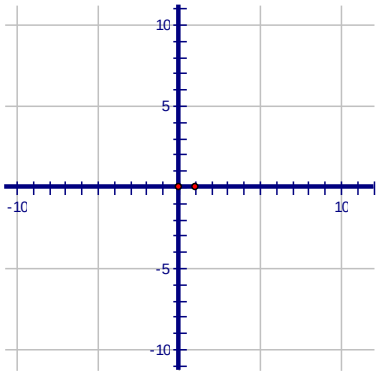
b. $\begin{cases} x = 4 - t^2 \\ y = \dfrac{t}{2} \end{cases}, -2 \le t \le 3$



c. $\begin{cases} x = 4\cos t \\ y = 4\sin t \end{cases}, 0 \le t \le \dfrac{3\pi}{2}$



d. $\begin{cases} x = e^t \\ y = t^2 \end{cases}, 0 \le t$



2. Sid is in a plane flying at an altitude of 3000 meters at a horizontal speed of 300 meters per second, and jumps out of the plane for skydiving. The parametric equations for his motion as a function of time are given below:

$$\begin{cases} x(t) = 300t \\ y(t) = -4.9t^2 + 3000 \end{cases}, 0 \le t$$

a. How high off the ground will Sid be if he releases his parachute after 5 seconds?

b. How far will he have traveled horizontally after 5 seconds?

3. Lily and Madelyn are having a catch. They are standing 55 feet apart, and Lily releases the ball, from 5 feet above the ground. The parametric equations that give the position of the ball are given below:

$$\begin{cases} x(t) = 68.71t \\ y(t) = -16t^2 + 13.36t + 5 \end{cases}$$

a. What is the horizontal distance the ball has traveled after 0.3 seconds?

b. What is the height after 0.3 seconds.

c. How high will the ball be when it reaches Madelyn?

4. Kevin hits a baseball, and the equations for the motion of the ball are below (units are in feet):

$$\begin{cases} x(t) = 142.66t \\ y(t) = -16t^2 + 46.35t + 5 \end{cases}$$

a. What is the horizontal displacement and height after 3 seconds?

b. What will be the height when it passes the pitcher, who is 60 feet away?

c. After how long will the baseball reach its maximum height?

d. What is the maximum height reached by the baseball?

e. How long will it take the ball to reach the fence that is 400 feet away?

f. Will the ball clear this fence, if it is 20 feet tall?

2.5: Parametric Equations Practice

1. Justine climbs on the Singapore Flier (the world's largest Ferris Wheel) at the bottom.

The parametric equations for Justine as she travels around the wheel are below (*x* and *y* are in feet, and *t* is in minutes):

$$\begin{cases} x(t) = 75\sin\left(\frac{\pi}{18}t\right) \\ y(t) = -75\cos\left(\frac{\pi}{18}t\right) + 80 \end{cases}$$

a. Graph on your calculator (make sure you are in radian mode).
Use the window x: [-100,100] and y: [0,200].

b. What is the maximum height of the Ferris Wheel?

c. How long does it take to go around the Ferris Wheel?

d. How high will Justine be after 21 minutes?

e. What will the first time be when Justine is 100 meters above the ground?

2. Lily and Madelyn are having a catch. Lily throws the ball and is standing at the origin.

The parametric equations for the motion of the ball after Lily throws the ball are below

(*t* is in seconds and *x* and *y* are in feet)

$$\begin{cases} x(t) = 35t \\ y(t) = -4.9t^2 + 7t + 5 \end{cases}$$

a. Graph the parametric equation on your calculator. Use the window *x:[0,70]* and *y:[0,10]*.

b. How high is the ball when it is released?

c. What is the horizontal distance of the ball after 0.3 seconds? What is the height?

d. What is the height of the ball when it reaches Madelyn (who is standing 55 feet away)?

3. The Independence Day fireworks at Memorial Park are fired, and the motion can be modeled by the following equations. The unit for *t* is seconds and the unit for *x* and *y* are in feet.

$$\begin{cases} x(t) = 12t \\ y(t) = -4.9t^2 + 87t \end{cases}$$

a. The firework is to be exploded at the maximum height. At what time does this occur?

b. What is the maximum height it reaches?

c. How far has the firework traveled horizontally when it explodes?

4. A softball pitcher throws a softball towards home plate, which is 43 feet from the mound.

The parametric equations for the path of the ball are below (the units are seconds for *t* and feet for *x* and *y*)

$$\begin{cases} x(t) = 50t \\ y(t) = -4.9t^2 + 5t + 2.7 \end{cases}$$

a. Find the amount of time it will take the softball to travel 43 feet.

b. The strike zone for a certain batter is between 1 and 4 feet above the ground. Will this pitch cross home plate in this strike zone?

c. Try to model this with your calculator. Use X_{2T}=43, Y_{2T}=1 and X_{3T}=43, Y_{3T}=4 to model the strike zone. You will also need to change your mode to *simultaneous*.