LESSON 6 – Piecewise Functions – Day 1 | Date:

(A) Lesson Objectives:

a. Introduce piecewise linear functions by means of real world applications
b. Define piecewise functions
c. Create graphs of piecewise functions from equations
d. Write equations of piecewise functions given graphs

(B) Definition:

A function may use different formulas on different parts of its domain. Such functions are said to be piecewise defined

(C) Exploratory Example:

a. A long distance calling plan charges $1.29 for any call up to 20 minutes in length and 7 cents for each additional minute (or each part of a minute)

i. What is the independent variable (input)? What would the domain be?

ii. What is the dependent variable (output)? What would the range be?

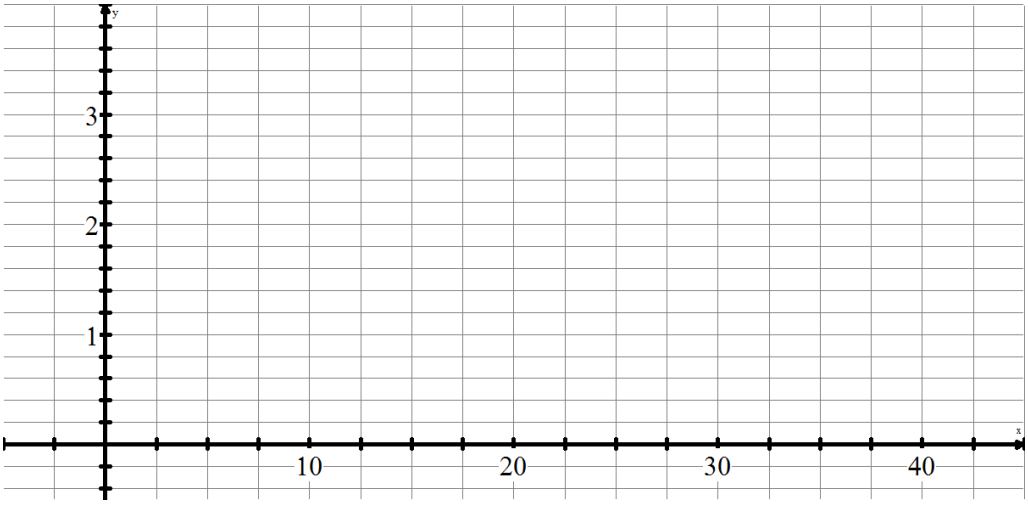
iii. Would you expect this relation to be a function? Why/why not?

iv. Evaluate C(50) and interpret.

v. Evaluate $2.41 = C(m) and interpret.

vi. To help draw a graph, complete the following table of values. Then graph this relation.

Time (min)	0	5	10	15	20	25	30	35	40
Cost ($)									



Now, how would you write an equation for this relation?

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(D) Working with Algebraic Examples

Piecewise functions are functions made up of different "pieces". See, for example, the following graph:

Do you see the two different parts?

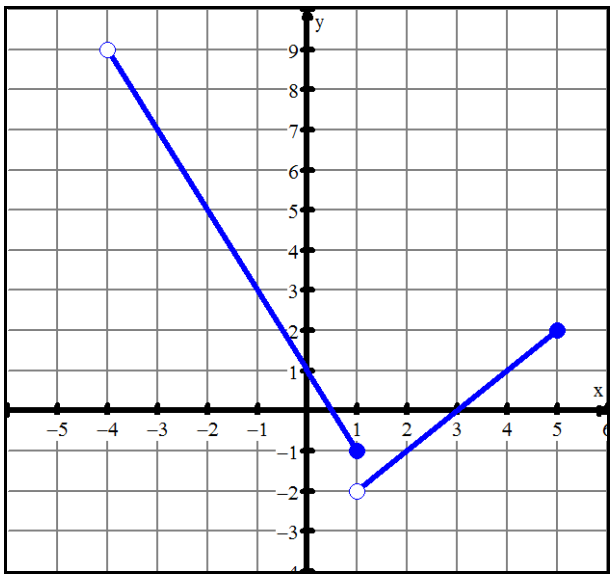
First part equation:

What x-values does the first part cover?

Second part equation:

What x-values does the second part cover

So, the equation defining what we see would be:



Evaluate USING THE EQUATION:

f(-2) =

f(0) =

f(1) =

f(2) =

f(5) =

f(-5) =

f(-4) =

Solve f(x) = -1

Evaluate USING THE GRAPH:

f(-2) =

f(0) =

f(1) =

f(2) =

f(5) =

f(-5) =

f(-4) =

Solve f(x) = -1

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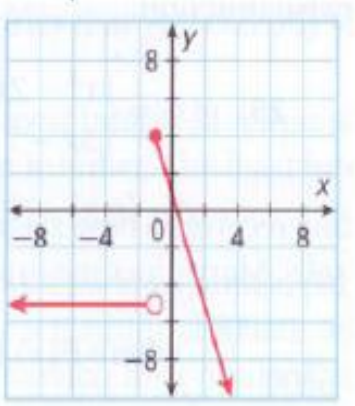
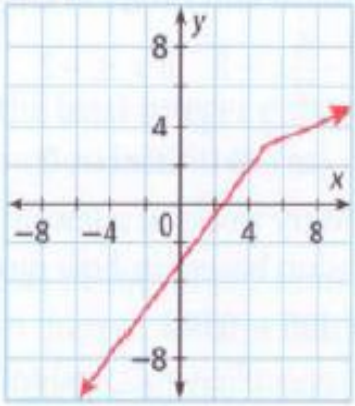
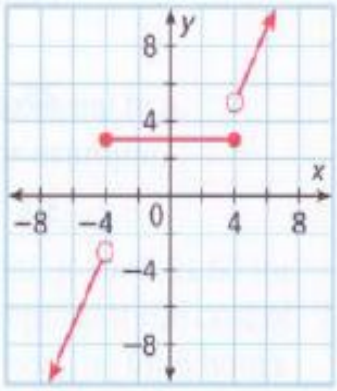
(E) Working with Algebraic Examples – Graph to Equation

3. Graph	Equation of the pieces	Domain for the pieces	Piecewise Function
			
4. Graph	Equation of the pieces	Domain for the pieces	Piecewise Function
			
5. Graph	Equation of the pieces	Domain for the pieces	Piecewise Function
			

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(F) Working with Algebraic Examples

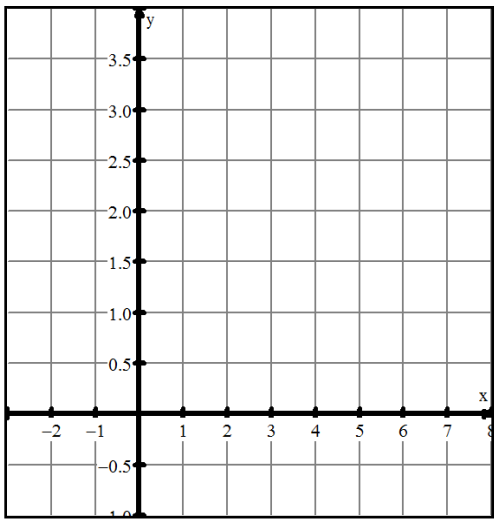
a. EXAMPLE #1: Consider the function $f(x)=\begin{cases} -x+1 & \text{if } -2\le x<1 \\ 2 & \text{if } x=1 \\ \frac{1}{2}x-1 & \text{if } x>1 \end{cases}$.

i. Determine $f(-2), f(0), f(1),$ and $f(2)$.

ii. Determine the domain of $f(x)$

iii. Graph $f(x)$.

iv. Determine the range of $f(x)$



b. EXAMPLE #2: Consider the function $f(x)=\begin{cases} 2\left(\frac{1}{2}\right)^x & \text{if } -4\le x<1 \\ x^2 & \text{if } 1\le x<3 \\ 12-x & \text{if } x\ge 3 \end{cases}$

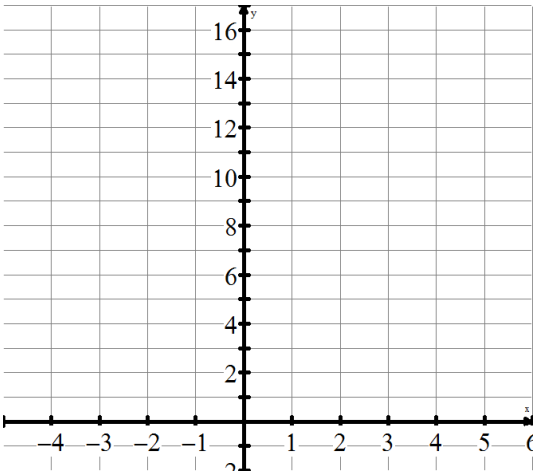
i. Determine $f(-1), f(2),$ and $f(4)$.

ii. Determine $f(1)$ and $f(3)$.

iii. Determine the domain of $f(x)$

iv. Graph $f(x)$ on your graphing calculator

v. Determine the range of $f(x)$



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(G) Working with Applications of Piecewise Functions

a. A museum charges $40 for a group of 10 or fewer people. A group of more than 1o people will pay $2.00 perperson for the number of people above 10 (in addition to the $40,00). For example, a group of 15 will pay $50. The maximum group size is 50 people.
   i. Draw a sketch that represents this situation. Show key points.
   ii. Write an equation in the form of C(p) = …… ?
   iii. What are the domain and range of this cost function

b. The charge for a taxi ride in New York City is $10.00 for the first half of a mile and then $1.50 for each additional quarter of a mile (rounded to the nearest quarter mile.)

   i. Make a data table showing the cost in dollars (***C***) of a trip as a function of the distance travelled, in miles (***m***). So the function will be called ***C***(***m***)
   ii. What is the cost for a 1.75 mile trip?
   iii. How far can you go for $25.00?
   iv. Sketch the graph, showing key points.

c. Functions can be described by the terms CONTINUOUS and DISCONTINUOUS. Explain what that means given the two examples you have worked through today in class.

(H) HOMEWORK

d. See the attached worksheet

(I) Video Links:

e. http://www.youtube.com/watch?v=-gwffMEr8i8
f. http://www.youtube.com/watch?v=BxaYyS6lsQ4&feature=relmfu
g.