

LESSON 6 – Piecewise Functions – Day 2

Date: _____

(A) Lesson Objectives:

- a. Introduce Piecewise 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

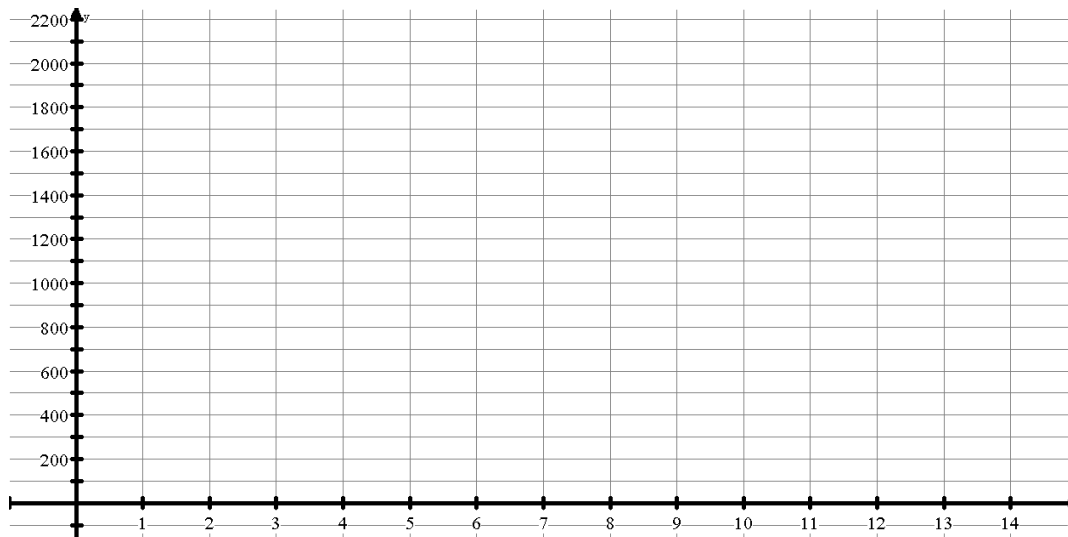
(B) Definition:

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 hotel has the following rates that apply to groups who rent their ballroom. They charge \$400 for any time of 2 hours or less. If the rental time exceeds 2 hours, then an additional rate of \$200 per hour are charged. However, if the total rental time is more than 8 hours, they only charge an hourly rate of \$100. All rentals are not allowed to exceed 12 hours.
 - 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 $C(7)$ as well as $C(11)$.
 - v. Evaluate $\$1150 = C(t)$ and interpret.
 - vi. To help draw a graph, complete the following table of values. Then graph this relation.

Time									
Cost (\$)									

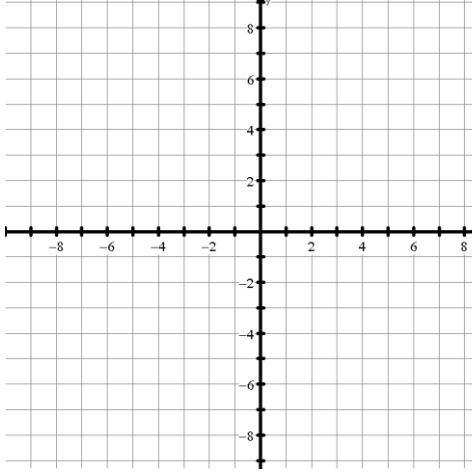
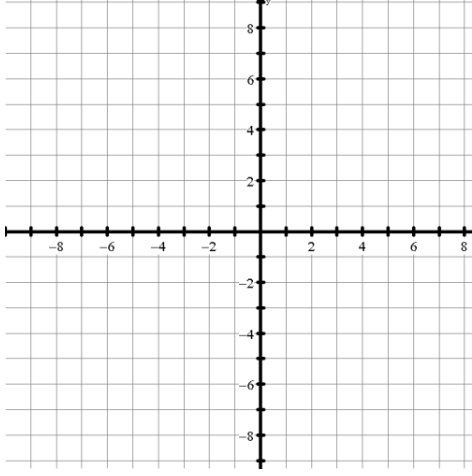
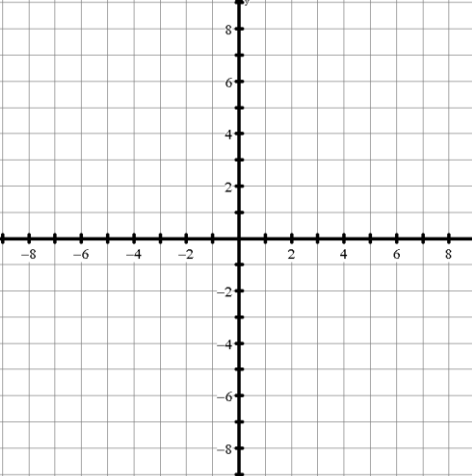


Now, how would you write an equation for this relation?

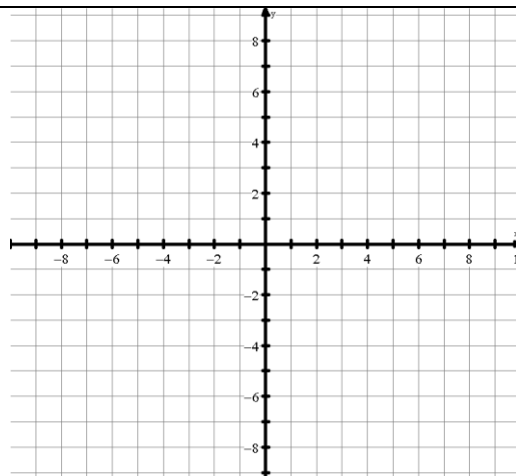
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(D) Working with Algebraic Examples

$g(x) = \begin{cases} x+3 & \text{if } x < -2 \\ -2x-3 & \text{if } x \geq -2 \end{cases}$		<p>Determine $g(-4)$, $g(-2)$, and $g(2)$.</p> <p>Determine the domain of $g(x)$.</p> <p>Graph $g(x)$.</p> <p>Determine the range of $g(x)$.</p>
$g(x) = \begin{cases} 1+x & \text{if } x < 0 \\ -x^2 & \text{if } x \geq 0 \end{cases}$		<p>Determine $g(-1)$, $g(0)$, and $g(2)$.</p> <p>Determine the domain of $g(x)$.</p> <p>Graph $g(x)$.</p> <p>Determine the range of $g(x)$.</p>
$h(t) = \begin{cases} 2-t & \text{if } -3 \leq t < 1 \\ \sqrt{t} & \text{if } t \geq 0 \end{cases}$		<p>Determine $h(-2)$, $h(1)$, and $h(4)$.</p> <p>Determine the domain of $h(t)$.</p> <p>Graph $h(t)$.</p> <p>Determine the range of $h(t)$.</p>

$$f(x) = \begin{cases} \frac{1}{x} & \text{if } x < 0 \\ \sqrt[3]{x} & \text{if } x \geq 0 \end{cases}$$



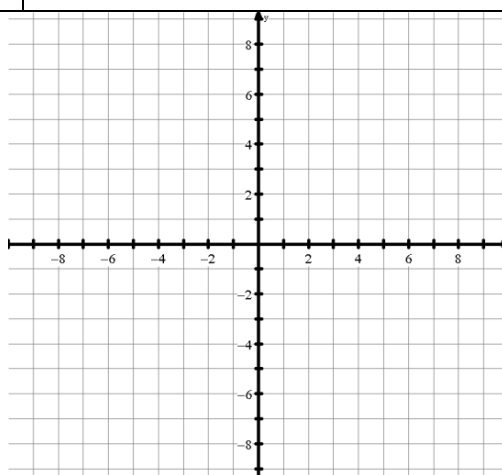
Determine $f(-1)$, $f(0)$, and $f(8)$.

Determine the domain of $f(x)$

Graph $f(x)$.

Determine the range of $f(x)$

$$a(x) = \begin{cases} |x-1| & \text{if } -2 \leq x < 2 \\ x^3 & \text{if } x \geq 2 \end{cases}$$



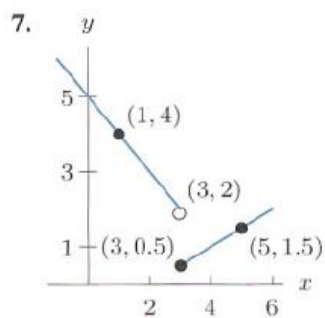
Determine $a(-1)$, $a(2)$, and $a(3)$.

Determine the domain of $a(x)$

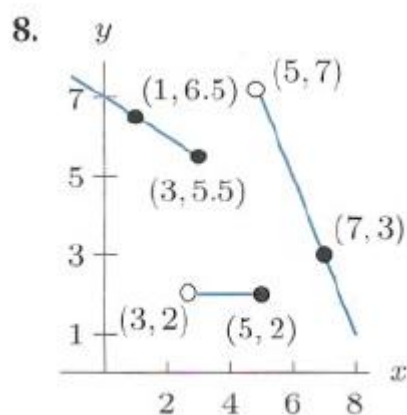
Graph $a(x)$.

Determine the range of $a(x)$

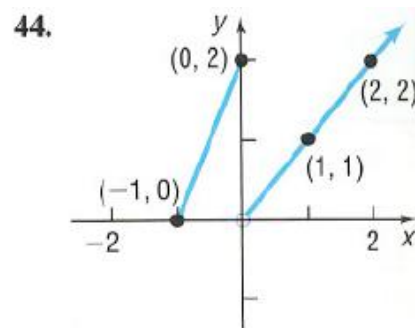
Write an equation for the function



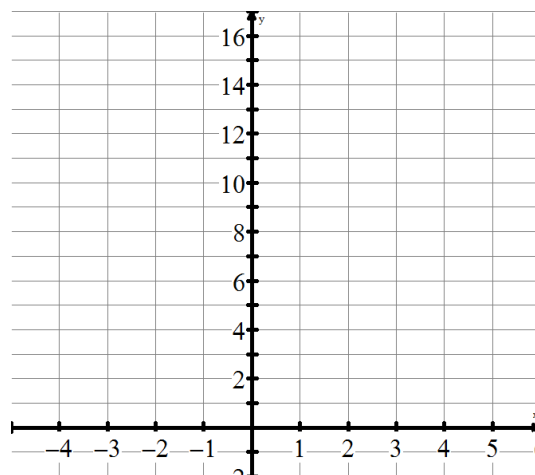
Write an equation for the function



Write an equation for the function



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



- i. Determine $f(-1)$, $f(1)$, $f(3)$, and $f(4)$.
- ii. Determine $f(1)$ and $f(3)$.
- iii. Determine the domain of $f(x)$.
- iv. Graph $f(x)$.
- v. Determine the range of $f(x)$.

14. The charge for a taxi ride in New York City is \$2.50 for the first $\frac{1}{4}$ of a mile, and \$0.40 for each additional $\frac{1}{4}$ of a mile (rounded up to the nearest $\frac{1}{4}$ mile).

- (a) Make a table showing the cost of a trip as a function of its length. Your table should start at zero and go up to two miles in $\frac{1}{4}$ -mile intervals.
- (b) What is the cost for a 1.25-mile trip?
- (c) How far can you go for \$5.30?
- (d) Graph the cost function in part (a).

15. A museum charges \$40 for a group of 10 or fewer people. A group of more than 10 people must, in addition to the \$40, pay \$2 per person for the number of people above 10. For example, a group of 12 pays \$44 and a group of 15 pays \$50. The maximum group size is 50.

- (a) Draw a graph that represents this situation.
- (b) What are the domain and range of the cost function?

(E) HOMEWORK

- a. [See the attached worksheet](#)

(F) Video Links:

- a. <http://www.youtube.com/watch?v=-gwffMEr8i8>
- b. <http://www.youtube.com/watch?v=BxaYyS6lsQ4&feature=relmfu>