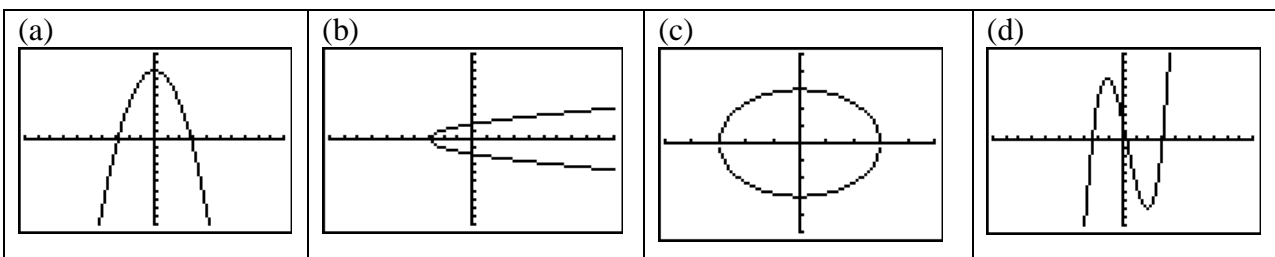


1. Which graphs below represent functions, and which do not? How do you know?



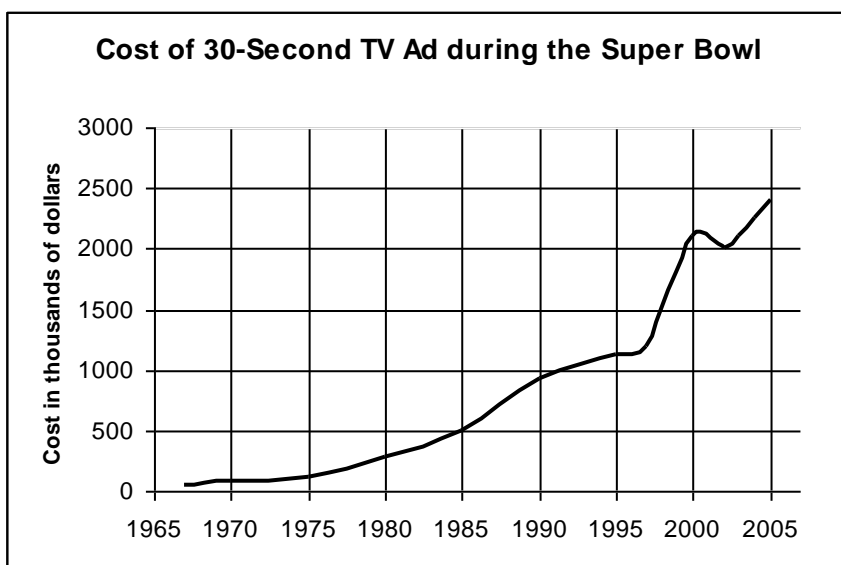
2. The following graph shows the cost (in thousands of dollars) of a 30-second television ad during the Super Bowl.

(a) Is it the graph of a function?

(b) Use the graph to determine

(i) The approximate cost of a 30-second Super Bowl ad in 2005.

(ii) The year in which a 30-second Super Bowl ad cost approximately \$1,000,000.



3. If $f(x) = 2x - 5$, find and simplify









(a) $f(3)$	(b) $f(a)$
(c) $f(a) + f(3)$	(d) $f(a + 3)$

4. If $g(x) = 3x^2 - 2x + 5$, find and simplify

(a) $g(-2)$	(b) $g(a + 4)$
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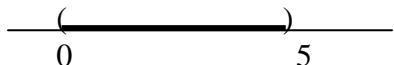
Interval Notation


An interval on the real number line can be described using set notation or **interval notation**. In interval notation, brackets indicate that the endpoints of the interval are included, and parentheses indicate that the endpoints are not included. The following chart shows how these are used.

Graph	Set Notation	Interval Notation	Type of Interval
	$x a \leq x \leq b$	$[a, b]$	Closed interval
	$x a < x < b$	(a, b)	Open interval
	$x a < x \leq b$	$(a, b]$	Half-open interval
	$x a \leq x < b$	$[a, b)$	Half-open interval
	$x x \geq a$	$[a, \infty)$	Infinite interval
	$x x > a$	(a, ∞)	Infinite interval
	$x x \leq b$	$(-\infty, b]$	Infinite interval
	$x x < b$	$(-\infty, b)$	Infinite interval

The notation $(-\infty, \infty)$ is used to represent the entire real number line, that is, all real numbers.

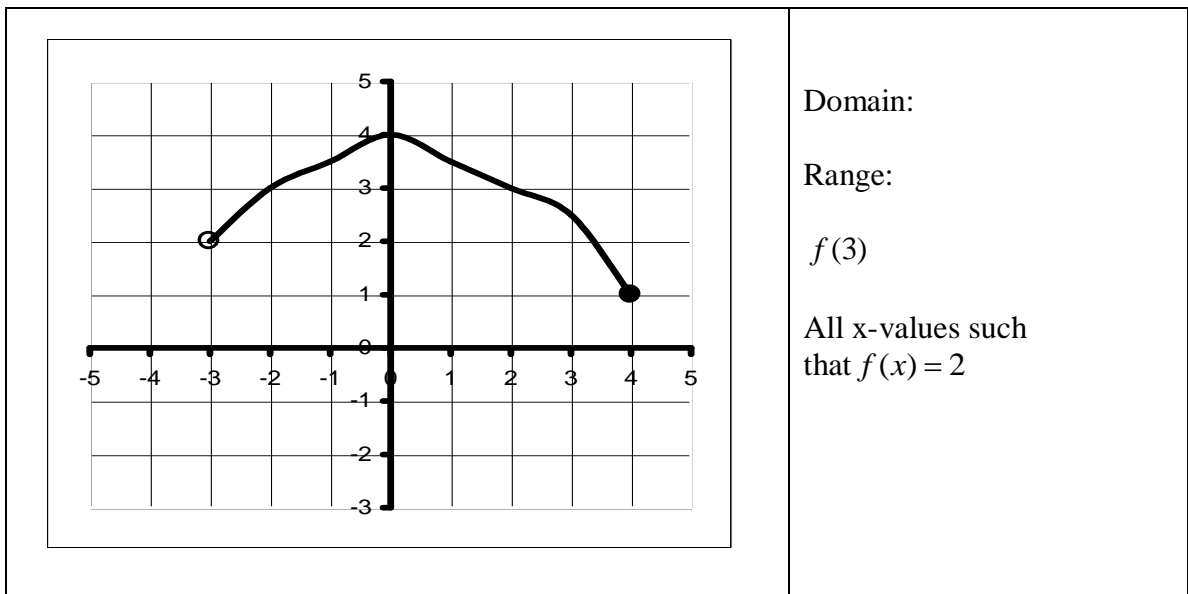
5. A portion of the real number system is represented in each problem below by a graph, set notation, or interval notation. Re-express each interval in the two alternative representations.

	Graph	Set-builder notation	Interval Notation
(a)		$x -3 \leq x \leq 1$	
(b)			
(c)			$(-8, 2]$

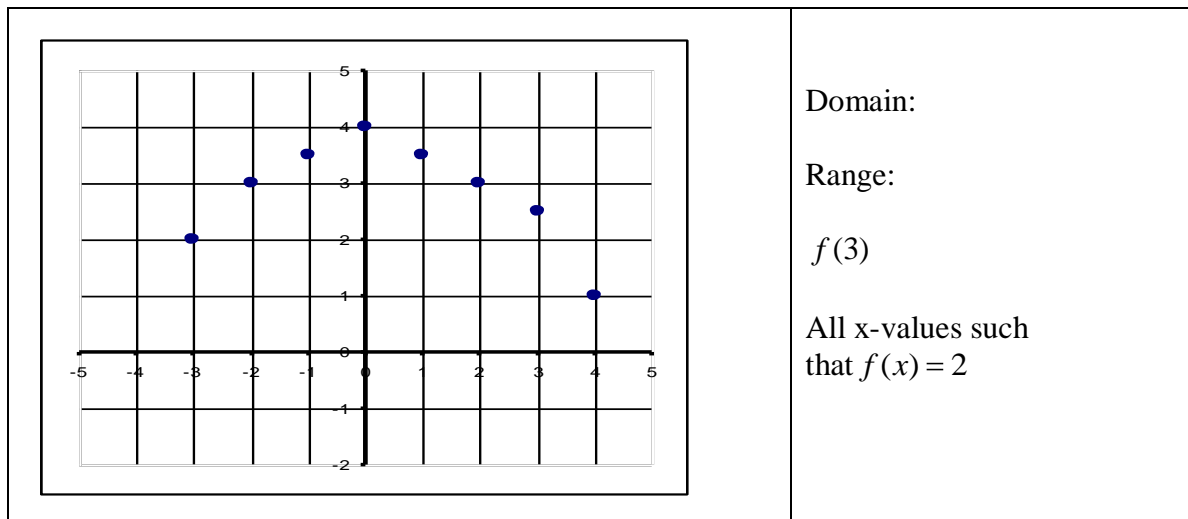
(d)		$x x > -4$	
(e)			
(f)			$(-3, \infty)$
(g)		$x x \leq 1$	

6. A graph of a function $f(x)$ is shown. In each case, state the domain and range of the function. Express your answer using interval notation if possible. For each function, also determine $f(3)$ and all x -values such that $f(x) = 2$.

(a)



(b)



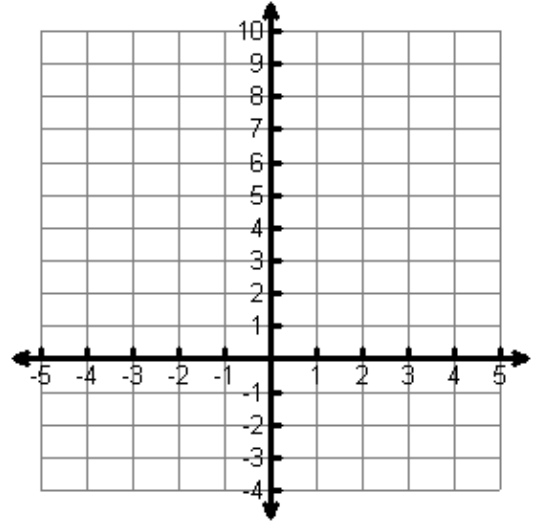
R.2: Functions & Models

Piecewise Defined Functions: Functions that have different output formulas for different parts of the domain.

1. Let $f(x) = \begin{cases} x + 3, & x \leq 0 \\ 3, & 0 < x \leq 2 \\ 2x - 1, & x > 2 \end{cases}$

a. $f(-1)$ b. $f(0)$

c. $f(2)$ d. $f(3)$



2. The number $C(t)$ of coffee shops and related enterprises in the US can be approximated by the following function of time t in years since 1990 (1990 corresponds to $t = 0$). (5 points)

$$C(t) = \begin{cases} 500t + 800 & \text{if } 0 \leq t \leq 4 \\ 1300t - 2400 & \text{if } 4 < t \leq 10 \end{cases}$$

(a) Evaluate $C(4)$ and $C(4)$, **and** interpret the results.

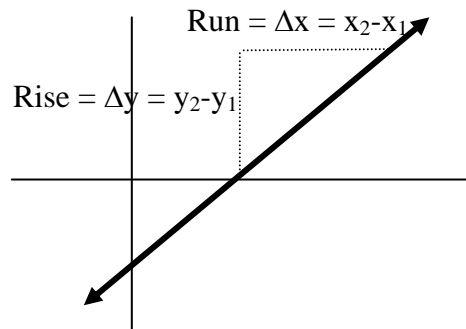
(b) How *fast* was the number of coffee shops in the US growing in 1992 and in 1995?

(c) Use the model to estimate when there were 5,400 coffee shops in the US.

1. The **slope** m of the line passing through the points (x_1, y_1) and (x_2, y_2) is defined by

$$m = \frac{\text{Rise}}{\text{Run}} = \frac{\text{vertical change}}{\text{horizontal change}} = \frac{\Delta y}{\Delta x}$$

$$= \frac{\text{difference in } y}{\text{difference in } x} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{y_1 - y_2}{x_1 - x_2}, \text{ where } x_1 \neq x_2$$



Use the slope formula to find the slope of the line containing the points

- (a) $(-2, 4)$ and $(1, 10)$ (b) $(-3, 4)$ and $(-1, -5)$

2. **Equation of a Line**

You can use either of the following to find the equation of a line.

Slope-Intercept Equation	Point-Slope Equation
$y = mx + b$ or $f(x) = mx + b$	$y - y_1 = m(x - x_1)$
The line has slope m and y-intercept $(0, b)$.	The line has slope m and contains the point (x_1, y_1) .

Write an equation of the line through each pair of points in question #1 above. You may use either equation above, but write the answer in the form $y = mx + b$.

(a)	(b)
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3. The slope of a line is a measure of the rate at which a line is changing. For that reason, it is also called the **rate of change** of the line.

In 1991, the cost of tuition and fees at public two-year colleges was \$800. This cost had increased to \$1300 by 1996. Find the average rate of change of the cost of tuition and fees during this time period. **Use appropriate units in your answer.**

The table shown gives the average salary (in thousands of dollars) for players in the National Basketball Association (NBA).

Years, x, since 1980	Average Salary (in thousands of dollars)
0 (1980)	170
4 (1984)	275
5 (1985)	325
6 (1986)	375
7 (1987)	440
8 (1988)	510
9 (1989)	603
10 (1990)	817

- (a) Enter the data in the table into your calculator and graph the data.

- (b) Let $y = f(x)$ represent the average salary (in thousands of dollars) for the year that is x years after 1980. Use the STAT feature of your calculator to find linear and quadratic regression models for $y = f(x)$. Write your results below. You may round coefficients to two decimal places.

linear:

quadratic:

- (c) On your calculator, graph your models along with the data. Which of these models do you think fits the data better?
- (d) Using the model you chose in part (c), what was the average salary of an NBA player in 2008?

USING THE STATISTICAL FEATURES OF THE TI-83/83+/84/84+

A. ENTERING DATA

1. Press the STAT menu key.
2. Choose the Edit...option.
3. Your calculator has six lists for data storage. Arrow left or right to enter your data in List 1 (L1) or in L2, L3, L4, L5 or L6.
4. If the list you wish to use already has data, choose another list or clear the list. To clear the list, press STAT, choose ClrList followed by the lists you want to clear, separated by commas. E.g. To clear List 1 and List 2, you would have ClrList L1, L2 and press ENTER.
5. Once your list is clear, go back to STAT, Edit and enter your data from the first column into one list. Simply type in the number and press ENTER. The cursor automatically drops to the next line. After entering the data in the first list, use the arrow key to begin entering the data in the second list. **Both lists must be of the same length.**

B. GRAPHING THE SCATTER PLOT

1. Press 2nd Y= to access the STAT PLOT menu.
2. You can store up to three plots at a time. Choose Plot 1, Plot 2 or Plot 3, and press ENTER.
3. Highlight On, press ENTER.
4. Highlight the first type plot shown, press ENTER.
5. For the XList, choose whichever list you used to store your first set of data (usually, this is L1), press ENTER.
6. For the YList, choose whichever list you used to store your second set of data (usually, this is L2), press ENTER.
7. Choose your mark, press ENTER. The first mark is the easiest to see.
8. Go to the Y = menu and clear or inactivate any existing functions.
9. Set the window automatically to see all of your data points by pressing ZOOM and then ZoomStat (#9). Alternatively, you can go to WINDOW and adjust the window settings yourself.

C. CALCULATING and GRAPHING A REGRESSION EQUATION

1. If you would like the calculator to give you an indication of how well the regression equation fits the data, you need to have Diagnostics turned on before finding the equation. To do this, go to CATALOG (press 2nd, 0), use the down arrow to go to Diagnostics On, and press ENTER to return to the home screen and press ENTER again.
2. Press STAT and select the CALC menu.
3. Choose the type of regression equation that is appropriate for your data. For example, if the data appeared to be linear, choose LinReg(ax+b).
4. Before pressing ENTER, press VARS, select Y-VARS, choose 1 for Function, and then choose Y1 to have the calculator enter the equation in Y1. (If you wanted the equation to be in Y2, select 2, and so on.)
5. Press ENTER. You should see the regression equation and, if you turned Diagnostics on, a number for R^2 . If R^2 is very close to 1 then the function is a good fit for the data.
6. Press GRAPH to see the graph of the function along with the data points.

D. TURNING THE PLOT MENUS OFF OR ON

When not using the Plot menus, you should turn them off because data entered in one of the List menus can interfere with your calculator's ability to graph. To do this very easily,

1. Go to the Y = menu.
2. Note that Plot 1, Plot 2, and Plot 3 appear at the top of the menu. If any of these is highlighted, bring the cursor to it by using the arrow keys, and then press ENTER to turn it off.
3. To turn a Plot menu on again, bring the cursor to the Plot you want to turn on, and then press ENTER.