

Warm Up

Create a table of values for each function.

1. $y = \underline{2x} - 3$

X	Y
-2	-7
-1	-5
0	-3
1	-1
2	1

2. $f(x) = 4x - x^2$

$-8-4$
 $-4-1$

x	y
-2	-12
-1	-3
0	0
1	3
2	12

"Success is to be measured not so much by the position one has reached in life as by the obstacles which he has overcome trying to succeed."

-Booker T. Washington

9-1 Multiple Representations of Functions

Objectives

Translate between the various representations of functions.

Solve problems by using the various representations of functions.

9-1 Multiple Representations of Functions

An amusement park manager estimates daily profits by multiplying the number of tickets sold by 20. This verbal description is useful, but other representations of the function may be more useful.



Equation

$$p = 20n$$

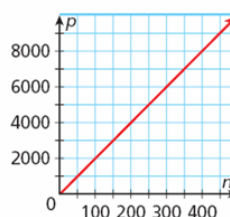
or

$$p(n) = 20n$$

Table

n	p
50	1000
100	2000
150	3000
200	4000

Graph

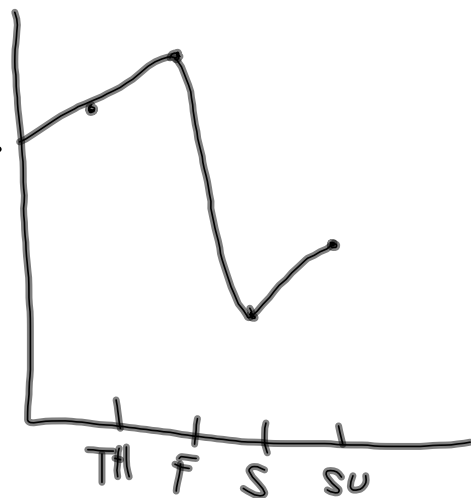


These different representations can help the manager set, compare, and predict prices.

When sketching, look for key words/situations that would cause a graph to increase/decrease

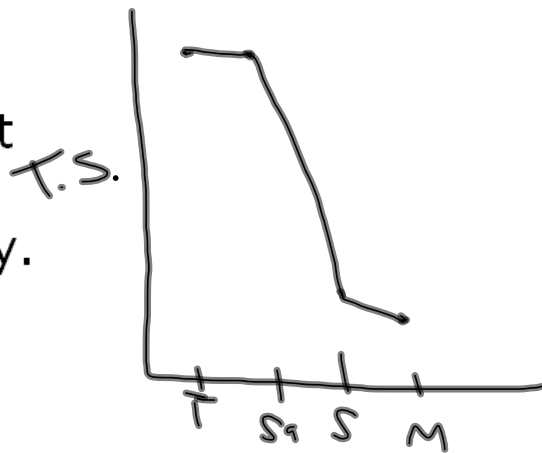
Sketch a possible graph to represent the following.

Ticket sales were good until a massive power outage happened on \nwarrow .S. Saturday that was not repaired until late Sunday.



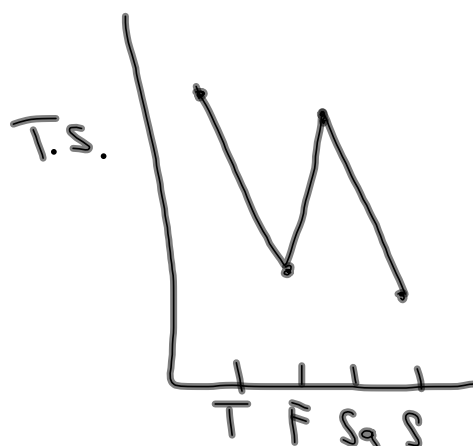
What if ...? Sketch a possible graph to represent the following.

The weather was beautiful on Friday and Saturday, but it rained all day on Sunday and Monday.



Sketch a possible graph to represent the following.

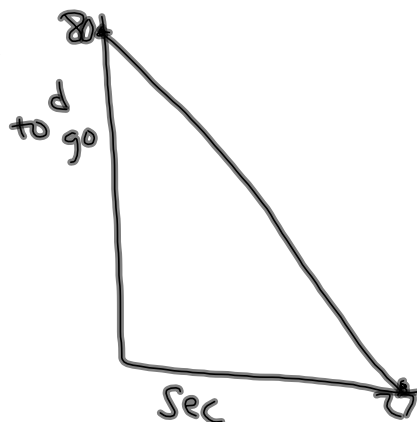
Only $\frac{1}{2}$ of the rides were running on Friday and Sunday.



Because each representation of a function (words, equation, table, or graph) describes the same relationship, you can often use any representation to generate the others.

Janet is rowing across an 80-meter-wide river at a rate of 3 meters per second. Create a table, an equation, and a graph of the distance that Janet has remaining before she reaches the other side. When will Janet reach the shore?

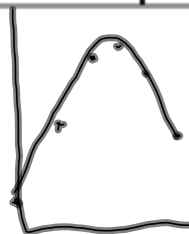
Sec	d to g
0	80
10	50
20	20
25	5
27	0



$$y = 80 - 3x$$

The table shows the height, in feet, of an arrow in relation to its horizontal distance from the archer. Create a graph, an equation, and a verbal description to represent the height of the arrow with relation to its horizontal distance from the archer.

Arrow Distance and Height						
Distance from Archer (ft)	0	75	150	225	300	375
Height (ft)	6.55	59.80	90.55	98.80	84.50	47.50



9-1

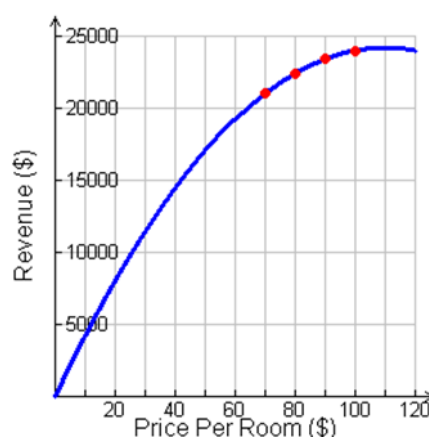
Multiple Representations of Functions

Translating Between Multiple Representations	
When given a(n) ...	Try to...
Table	<ul style="list-style-type: none"> Find finite differences or ratios to determine which parent function best describes the data. Graph points as ordered pairs and look for a pattern. Match the data to the related parent function, if applicable, and perform a regression.
Graph	<ul style="list-style-type: none"> Identify which parent function the graph most resembles, and then use key points (intercepts, maxima, minima, and so on) from the graph to help write an equation. Locate several points on the graph and write them in a table. Use slope; increasing, decreasing, or constant intervals; and intercepts to write a verbal description.
Equation	<ul style="list-style-type: none"> Make a table of values. You may use a graphing calculator. Make a graph by using transformations of parent functions or a graphing calculator.
Verbal Description	<ul style="list-style-type: none"> Identify dependent and independent variables, and write an algebraic equation. Generate a table of values by using the pattern described. Sketch a graph of the situation by using hints from the description about increasing, decreasing, or constant intervals, as well as intercepts.

A hotel manager knows that the number of rooms that guests will rent depends on the price. The hotel's revenue depends on both the price and the number of rooms rented. The table shows the hotel's average nightly revenue based on room price. Use a graph and an equation to find the price that the manager should charge in order to maximize his revenue.

The data do not appear to be linear, so check finite differences.

Price per Room (\$)	Revenue (\$)
70	21,000
80	22,400
90	23,400
100	24,000



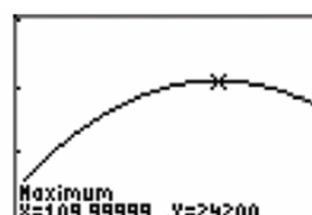
If your first differences are constant then the equation will be linear. If your second differences are constant then your equation will be quadratic, and if you have a common ratio then your data is exponential.

9-1 Multiple Representations of Functions

Example 3A Continued

```
QuadReg
y=ax2+bx+c
a=-2
b=440
c=0
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WINDOW
Xmin=70
Xmax=130
Xscl=10
Ymin=20000
Ymax=26000
Yscl=2000
Xres=1
```



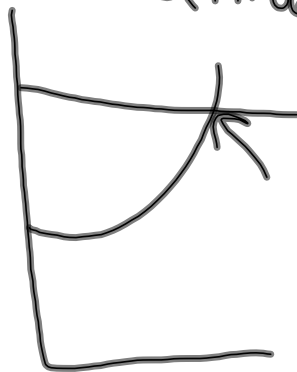
The equation $y = -2x^2 + 440x$ models the data, and the graph appears to fit. Use the **TRACE** or **MAXIMUM** feature to identify the maximum revenue yield. The maximum occurs when the hotel manager charges \$110 per room.

An investor buys a property for \$100,000. Experts expect the property to increase in value by about 6% per year. Use a table, a graph and an equation to predict the number of years it will take for the property to be worth more than \$150,000.

$$y = A_0(1 \pm \%)^t$$

$$100000(1 + 0.06)^t$$

$$150000 = 100000(1.06)^t$$



Bartolo opened a new sporting goods business and has recorded his business sales each week. To break even, Bartolo needs to sell \$48,000 worth of merchandise in a week. Assuming the sales trend continues, use a graph and an equation to find the number of weeks before Bartolo breaks even.

Bartolo's Sales	
Week	Sales (\$)
1	25,000
2	27,500
3	30,250
4	33,275
5	36,603

Homework

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