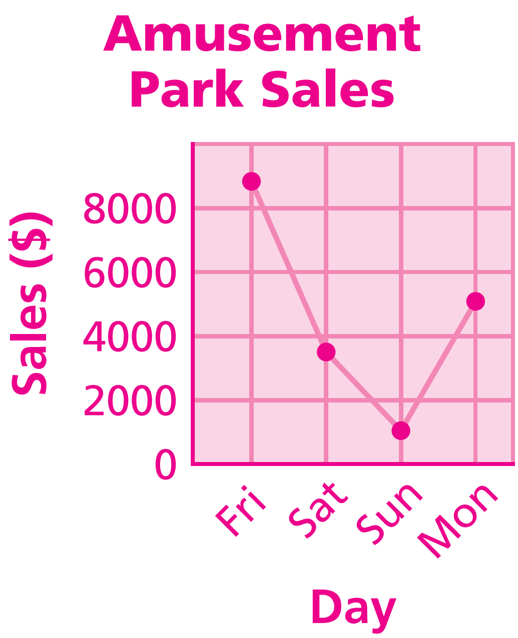
ADDITIONAL EXAMPLES

9-1 Multiple Representations of Functions

Example 1 Business Application

Sketch a possible graph to represent the following.

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



9-1 Multiple Representations of Functions

Example 2 Recreation Application

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?

Step 1 Create a table.

Let t be the time in seconds and d be Janet's distance, in meters, from reaching the shore.

Janet begins at a distance of 80 meters, and the distance decreases by 3 meters each second.

Time (s)	Distance (m)
0	80
1	77
2	74
3	71
4	68

Step 2 Write an equation.

Distance	is equal to	80	minus	3 meters per second.
d	$=$	80	$-$	$3t$

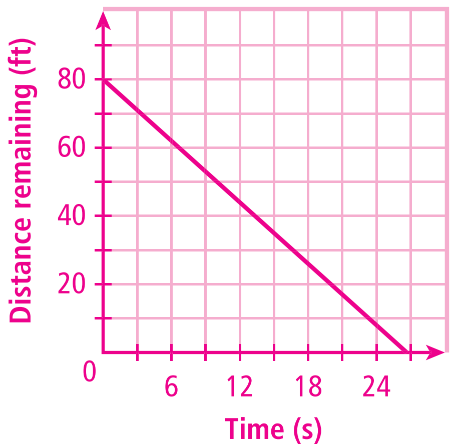
Step 3 Find the intercepts and graph the equation.

d-intercept: 80

Solve for t when $d = 0$.

$$d = 80 - 3t$$
$$0 = 80 - 3t$$
$$-80 = -3t$$
$$t = \frac{-80}{-3} = 26\frac{2}{3}$$

t-intercept: $26\frac{2}{3}$



Janet will reach the shore after $26\frac{2}{3}$ seconds.

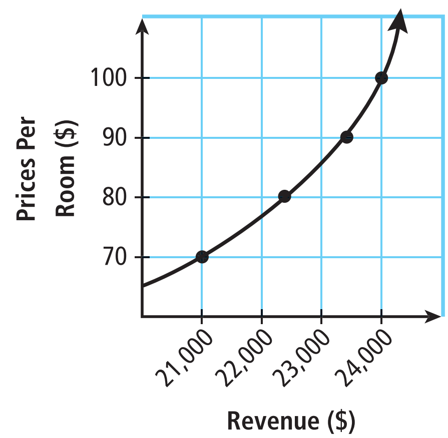
9-1 Multiple Representations of Functions

Example 3 Using Multiple Representations to Solve Problems

A. 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.

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

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



Revenue	21,000		22,400		23,400		24,000
First differences		1,400		1,000		600	
Second differences			400		400		

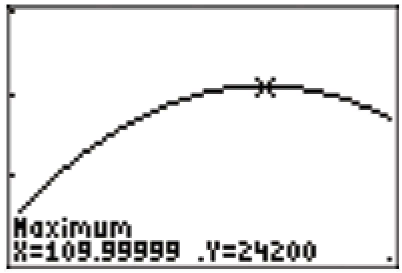
Because the second differences are constant, a quadratic model is appropriate. Use a graphing calculator to perform a quadratic regression on the data.

9-1 Multiple Representations of Functions

Example 3 Using Multiple Representations to Solve Problems (continued)

```
QuadReg
 y=ax²+bx+c
 a=-2
 b=440
 c=0
```

```
WINDOW
 Xmin=70
 Xmax=130
 Xscl=10
 Ymin=20000
 Ymax=26000
 Yscl=2000
 Xres=1
```

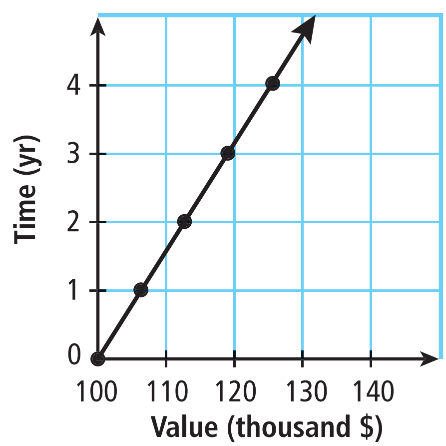


The equation $y = -2x^2 + 440x$ models the data, and the graph appears to fit. Use the **TRACE** or **MAXIMUM** feature to identify the maximum revenue yield. The maximum occurs when the hotel manager charges $110 per room.

B. 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.

Make a table for the property. Because you are interested in the value of the property, make a graph by using years t as the independent variable and value as the dependent variable.

Property Value	
Time (yr)	Value ($)
0	$100,000
1	$106,000
2	$112,360
3	$119,102
4	$126,248



9-1 Multiple Representations of Functions

Example 3 Using Multiple Representations to Solve Problems (continued)

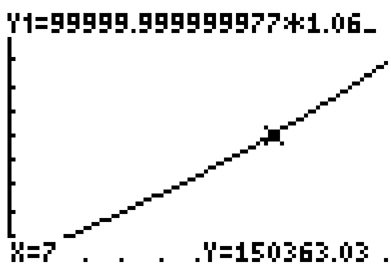
The data appear to be exponential, so check for a common ratio.

$$r_1 = \frac{y_1}{y_0} = \frac{106{,}000}{100{,}000} = 1.06 \qquad r_2 = \frac{y_2}{y_1} = \frac{112{,}360}{106{,}000} = 1.06$$

$$r_3 = \frac{y_3}{y_2} = \frac{119{,}102}{112{,}360} \approx 1.06 \qquad r_4 = \frac{y_4}{y_3} = \frac{126{,}248}{119{,}102} \approx 1.06$$

Because there is a common ratio, an exponential model is appropriate. Use a graphing calculator to perform an exponential regression on the data.

```
WINDOW
 Xmin=0
 Xmax=10
 Xscl=1
 Ymin=100000
 Ymax=200000
 Yscl=10000
 Xres=1
```




```
ExpReg
 y=a*b^x
 a=100000
 b=1.06
 r²=1
 r=1
```

The equation $y = 100{,}000(1.06)^x$ models the data, and the graphs appear to fit. Use the **TRACE** feature to identify the value of x that corresponds to 150,000 for y. It appears that the property will be worth more than $150,000 after 7 years.