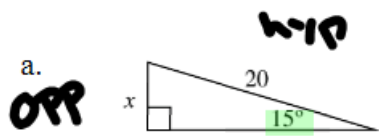
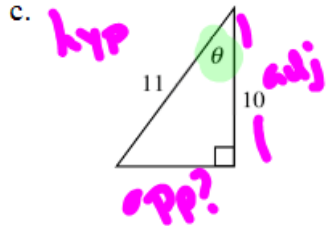


2-9. For each diagram below, write and solve an equation to calculate the value of the variable. If you need help, refer to the Math Notes box in this lesson. State your answer to part (d) in both approximate decimal form and radical form. [Homework Help](#)



$$\sin(\theta) = \frac{\text{opp}}{\text{hyp}}$$

$$24[\sin(15^\circ)] = \left[\frac{x}{20}\right] 20$$



$$20[\sin(15^\circ)] = x$$

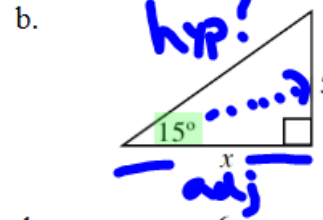
$$5.176 \approx x$$

$$\cos(\theta) = \frac{\text{adj}}{\text{hyp}}$$

$$\cos^{-1}[\cos(\theta)] = \left[\frac{10}{11}\right] \cos^{-1}$$

$$\theta = \cos^{-1}\left[\frac{10}{11}\right]$$

$$\theta \approx 24.62^\circ$$



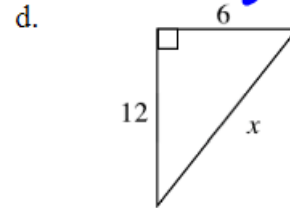
$$\tan(\theta) = \frac{\text{opp}}{\text{adj}}$$

$$x[\tan(15^\circ)] = \left[\frac{5}{x}\right] x$$

$$\frac{x \cdot [\tan(15^\circ)]}{\tan(15^\circ)} = \frac{5}{\tan(15^\circ)}$$

$$x = \frac{5}{\tan(15^\circ)}$$

$$x \approx 18.660$$



$$a^2 + b^2 = c^2$$

$$6^2 + 12^2 = x^2$$

$$36 + 144 = x^2$$

$$180 = x^2$$

$$\sqrt{180} = x$$

$$x \approx 13.414$$

$$x = \sqrt{36 \cdot 5}$$

$$x = \sqrt{36} \cdot \sqrt{5}$$

$$x = 6\sqrt{5}$$

2-21. Solve each of the following equations.

a.  $\frac{3}{x} + 6 = -45$   
 $\quad \quad -6 \quad -6$

$$\frac{3}{x} = -51 \quad \sqrt[3]{\left(\frac{x}{3}\right) = \left(\frac{1}{-51}\right)^3}$$

$$x = -\frac{3}{51}$$

$$\frac{5}{5} = \frac{5}{25}$$

$$\frac{10}{2} = \frac{10}{2}$$

b.  $5 \cdot \frac{8(x-2)}{5} = \left(\frac{10-x}{8}\right)^{8 \cdot 5}$

$$8(x-2) = 5(10-x)$$

$$x \approx .059$$

c.  $(x+1)(x-3) = 0$

$$\begin{array}{r} 8x - 16 = 50 - 5x \\ +5x + 16 \quad +16 + 5x \end{array}$$

$$x+1=0$$

$$x-3=0$$

$$\frac{13x}{13} = \frac{66}{13}$$

$$x = \frac{66}{13}$$

$$x = -1 \quad x = 3$$

2-34. Below are two situations that can be described using exponential functions. They represent a small sample of the situations where quantities grow or decay by a constant percentage over equal periods of time. For each situation: [Homework Help](#)

- What is an appropriate unit of time (such as days, weeks, years)?
- What is the multiplier?
- What is the initial value?
- Write an exponential equation in the form  $f(x) = ab^x$  that represents the situation.

a. The value of a car with an initial purchase price of \$12,250 depreciates by 11% per year.

b. An investment of \$1000 earns 6% annual interest, compounded monthly.

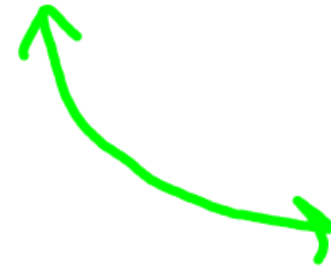
a. Years,  $1 - .11 = .89$ , 12,250

$$f(x) = 12250(.89)^x$$

initial      multiplier

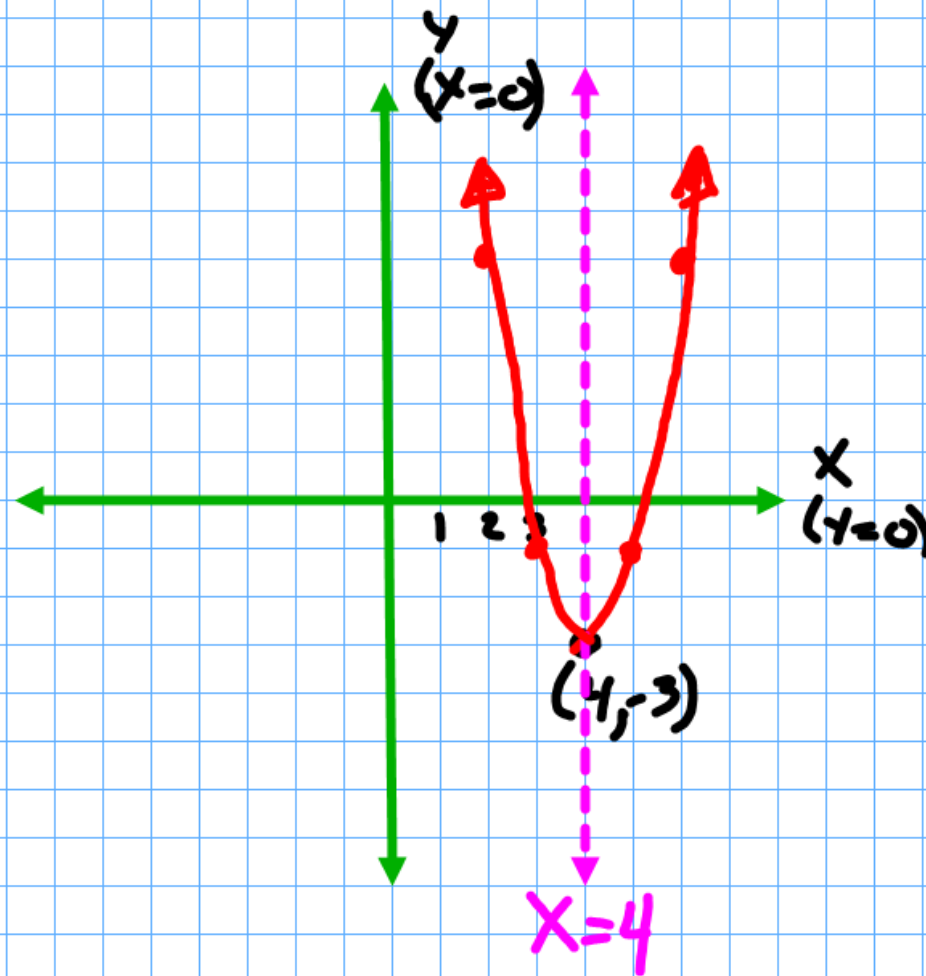
b. Months,  $\frac{.06}{12} = .005$ , 1000  
~~1 + .06~~  
 Years

$$f(x) = 1000(1.005)^x$$



Input  
(years)

2-37. Sketch a graph and draw the line of symmetry for the function  $y = 2(x - 4)^2 - 3$ .  
 What is the equation of the line of symmetry? [Homework Help](#)



x	x <sup>2</sup>	2x <sup>2</sup>
1	1	2
2	4	8
3	9	18

2-85. The Spark City event planners are planning a big fireworks display for the 4<sup>th</sup> of July. The fireworks will launch from a boat in the bay, and must land in a designated “fire safe” zone 100 meters away. To be visible above the buildings and the trees, the fireworks must reach at least 30 meters high.

Write an equation that could model the path of the fireworks. [Homework Help](#)

$$y = a(x-h)^2 + k$$

$$y = a(x-50)^2 + 30$$

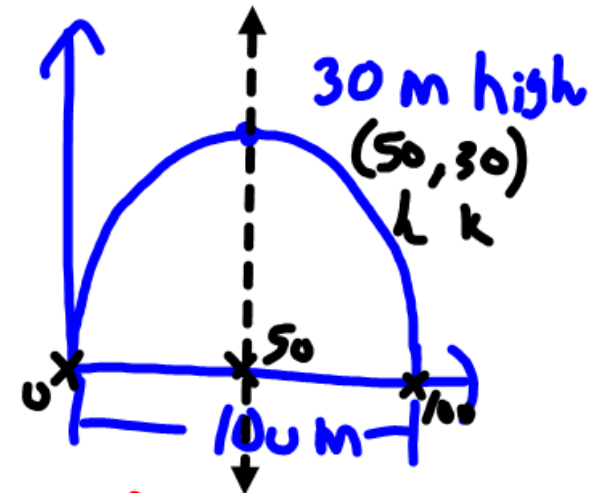
$$y = a(x-100)(x-0)$$

$$30 = a(50-100)(50)$$

$$30 = a(-50)(50)$$

$$30 = a(-2500)$$

$$-\frac{30}{2500} = a$$



$$y = -0.12(x-50)^2 + 30$$

2-95. Determine if each of the following functions are odd, even, or neither.

a.  $y = 3x^3$

$$-f(x) = f(-x) \quad f(x) = f(-x)$$

b.  $y = x^2 + 16$

c.  $y = \frac{x^4}{2}$

odd

$$f(x)$$

$$y = 3x^3$$

$$f(-x)$$

$$y = 3(-x)^3$$

$$y = -3x^3$$

$$-f(x)$$

$$y = -(3x^3) = -3x^3$$

even

$$y = x^2 + 16$$

$$y = (-x)^2 + 16$$

$$y = x^2 + 16$$

$$y = -(x^2 + 16) = -x^2 - 16$$

even

$$y = \frac{x^4}{2}$$

$$y = \frac{(-x)^4}{2} = \frac{x^4}{2}$$

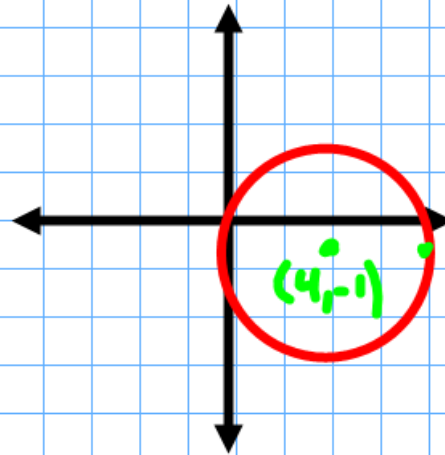
$$y = -\left(\frac{x^4}{2}\right) = -\frac{x^4}{2}$$


2-102. Consider the equation  $(x - 4)^2 + (y + 1)^2 = 16$ . [Homework Help](#)

- $(x-4)^2 (y--1)^2$
- What is the shape of the graph? How can you tell?
  - What information can you learn about the graph just by looking at the equation?
  - Sketch a graph of  $(x - 4)^2 + (y + 1)^2 = 16$ .

a. Circle  $(x-h)^2 + (y-k)^2 = r^2$

b. locator  $(h,k)$   
 ↑  
 center.  
 $(4, -1)$



**2-128.** Throughout this book, key problems have been selected as “checkpoints.” Each checkpoint problem is marked with an icon like the one at left. These checkpoint problems are provided so that you can check to be sure you are building skills at the expected level. When you have trouble with checkpoint problems, refer to the review materials and practice problems that are available in the Checkpoint Materials section at the back of your book. [Homework Help](#) 



This problem is a checkpoint for solving quadratic equations. It will be referred to as [Checkpoint 2](#).

Solve each quadratic equation.

a.  $x^2 - x - 6 = 0$

$$\begin{array}{r} -6x^2 \\ -3x + 2x \\ -1x \end{array}$$

$$(x-3)(x+2) = 0$$

$$\begin{array}{l} x = 3 \\ x = -2 \end{array}$$

b.  $5x^2 - 8 = 12x$

c.  $x^2 - 8x + 20 = 0$

d.  $2y^2 - 5y = 12$

$$2y^2 - 5y - 12 = 0$$


$$\begin{array}{r} -4 \quad | \quad -8y \quad | \quad -12 \\ y \quad | \quad 2y^2 \quad | \quad -3y \\ \hline \quad \quad | \quad 2y \quad -3 \end{array}$$

$$\begin{array}{r} -24y^2 \\ -8y + 3y \\ -5y \end{array}$$

$$(y-4)(2y+3) = 0$$

$$\begin{array}{ll} y-4=0 & y=-4 \\ 2y+3=0 & y=-\frac{3}{2} \end{array}$$



**2-128.** Throughout this book, key problems have been selected as “checkpoints.” Each checkpoint problem is marked with an icon like the one at left. These checkpoint problems are provided so that you can check to be sure you are building skills at the expected level. When you have trouble with checkpoint problems, refer to the review materials and practice problems that are available in the Checkpoint Materials section at the back of your book. [Homework Help](#) 



This problem is a checkpoint for solving quadratic equations. It will be referred to as [Checkpoint 2](#).

$$5x^2 - 12x - 8 = 0$$

$$\begin{aligned} a &= 5 \\ b &= -12 \\ c &= -8 \end{aligned}$$

$$x = \frac{-(-12) \pm \sqrt{(-12)^2 - 4(5)(-8)}}{2(5)}$$

$$x^2 - 8x + 20 = 0$$

$$\begin{aligned} a &= 1 \\ b &= -8 \\ c &= 20 \end{aligned}$$

$$x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(20)}}{2(1)}$$

$$x = \frac{8 \pm \sqrt{64 - 80}}{2}$$

$$x = \frac{8 \pm \sqrt{-16}}{2}$$

$$x = \frac{8 \pm 4i}{2}$$

$$x = \frac{8}{2} \pm \frac{4i}{2} \quad x = 4 \pm 2i$$

$$\begin{aligned} \sqrt{-16} &= 4i \\ \sqrt{-1} \cdot \sqrt{16} \\ i \cdot 4 \end{aligned}$$

Solve each quadratic equation.

a.  $x^2 - x - 6 = 0$

b.  $5x^2 - 8 = 12x$   
 ~~$-12x - 12x$~~

c.  $x^2 - 8x + 20 = 0$

d.  $2y^2 - 5y = 12$