Top graph:

Altitude (in thousands)

Y-axis values: 40, 30, 20, 10

X-axis: Time (hours) — .5, 1, 1.5, 2, 2.5, 3, 3.5

Bottom graph:

Distance (miles)

Y-axis values: 2000, 1500, 1000, 500

X-axis: Time (hours) — .5, 1, 1.5, 2, 2.5, 3, 3.5

1. 150 mg of a certain medicine is taken every four hours. During the four-hour period, the amount of medicine in the blood stream declines until the next dose is taken. Which of the following graphs *best* represents the amount of medicine in the blood stream over a period of time?

A

B

C

D
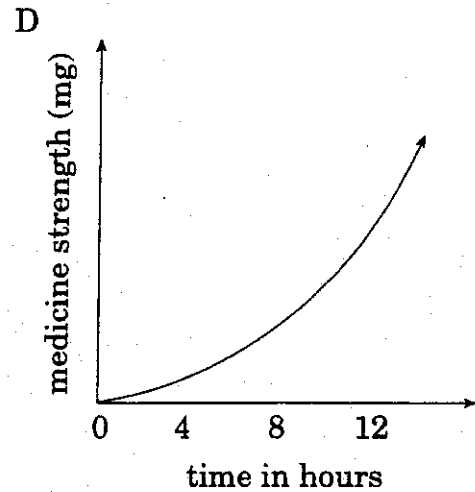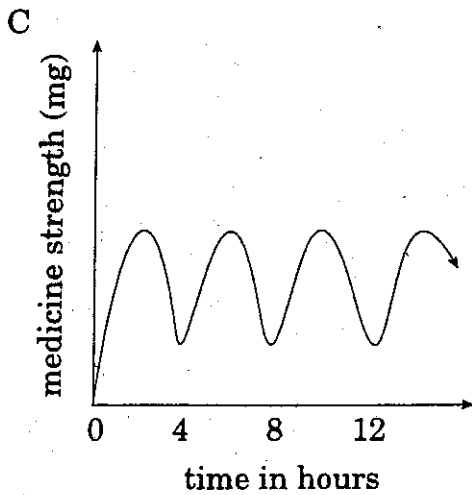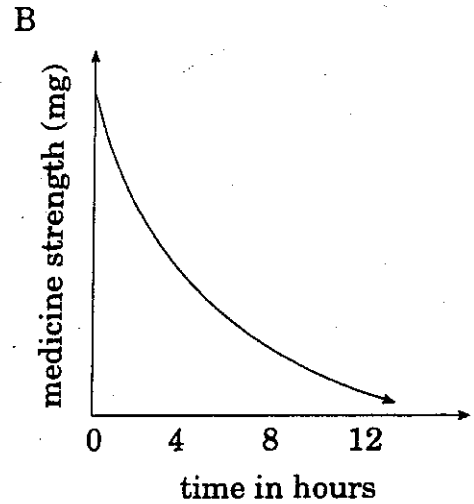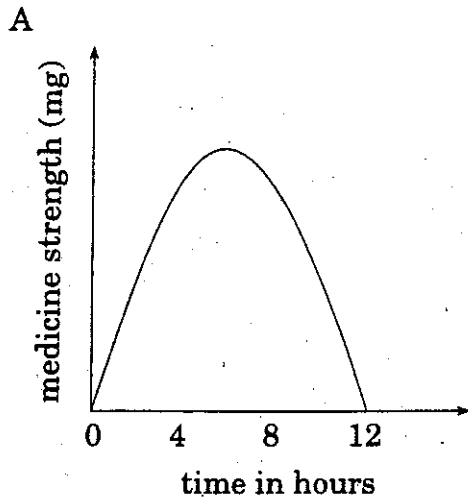
2. Which graph *best* represents the relationship between the amount of time spent studying and the grade received on a test?

A

Union High School Survey

B

Union High School Survey

C

Union High School Survey

D

Union High School Survey
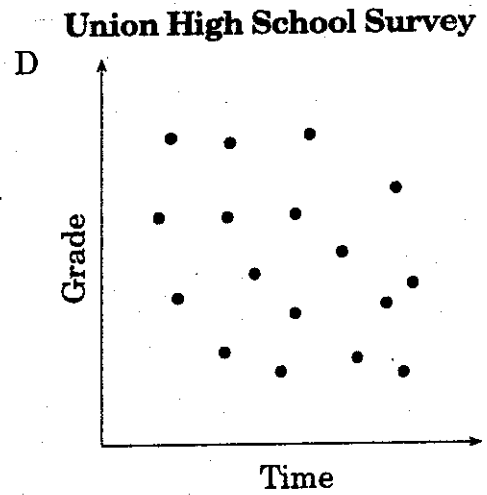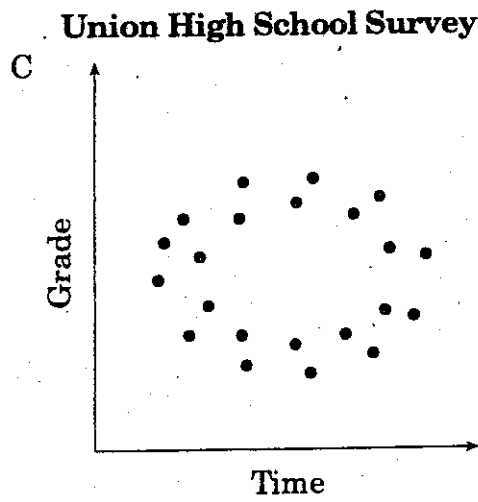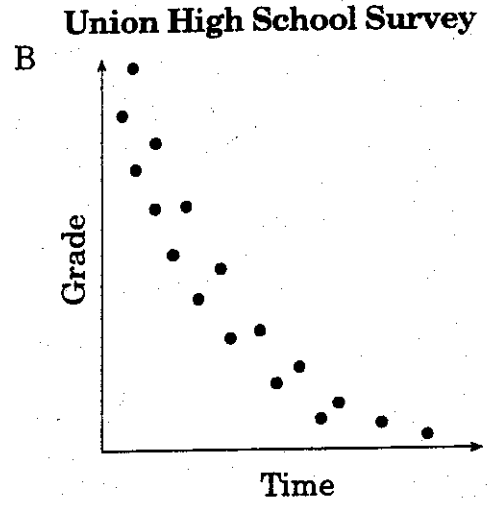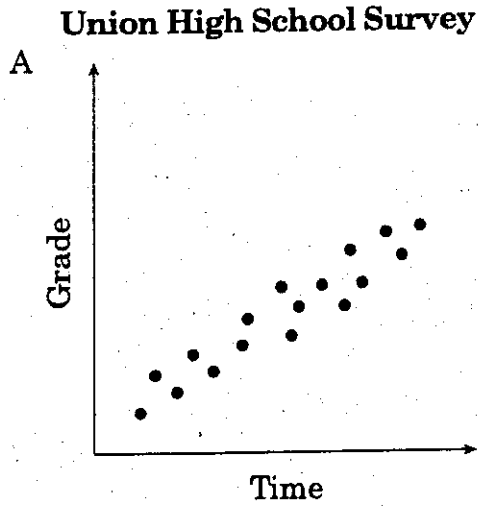
3.   Which graph *best* represents the height of kindergartners
     in Mrs. Evans' class?

A

Mrs. Evans' Class

B

Mrs. Evans' Class

C

Mrs. Evans' Class

D

Mrs. Evans' Class
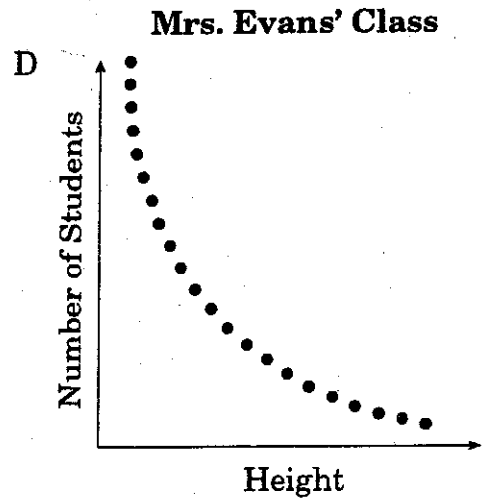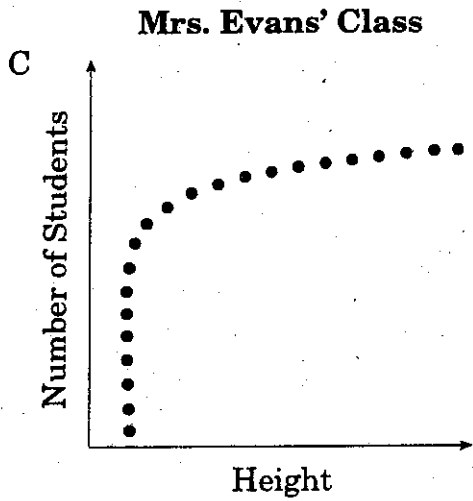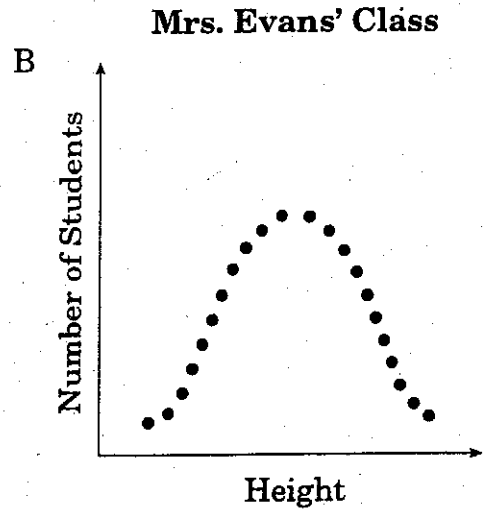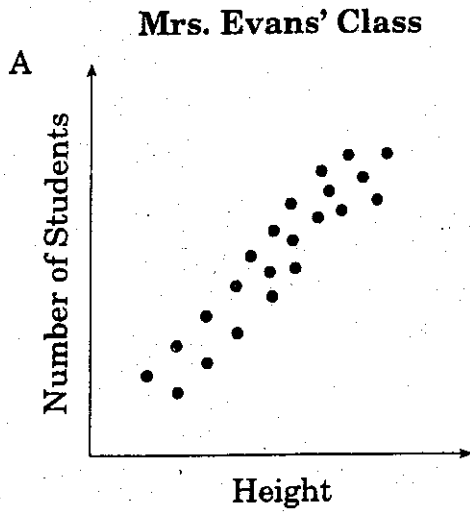
4.   Which graph *best* represents the relationship between the number of gallons of gas in a car's tank and the number of miles driven when the car starts off with a full tank?

A

B

C

D
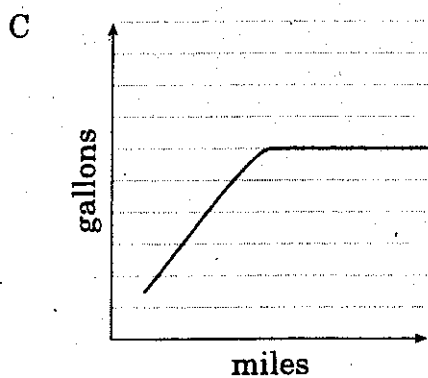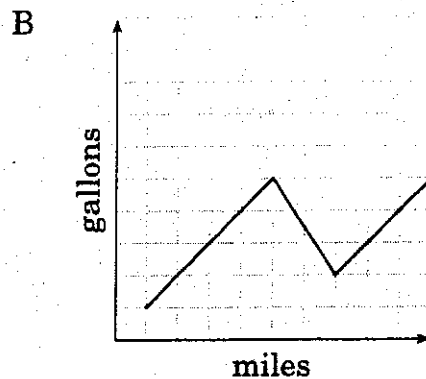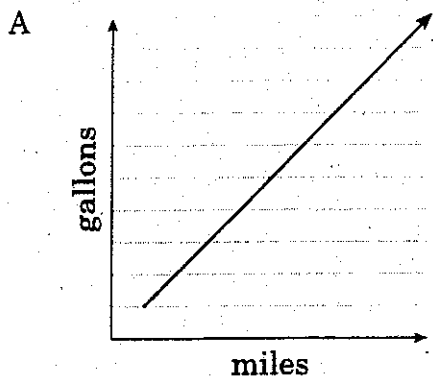
5. Which graph **best** represents the temperature of an ice-cold glass of tea left on a kitchen table for a period of time?
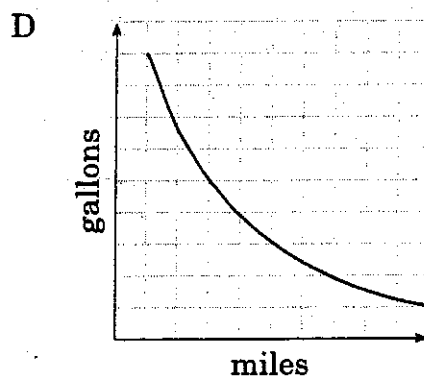
A
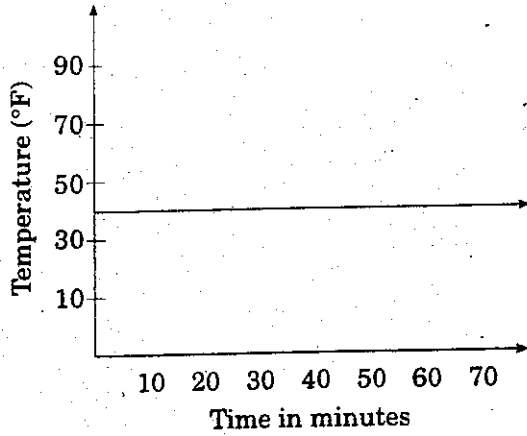
B
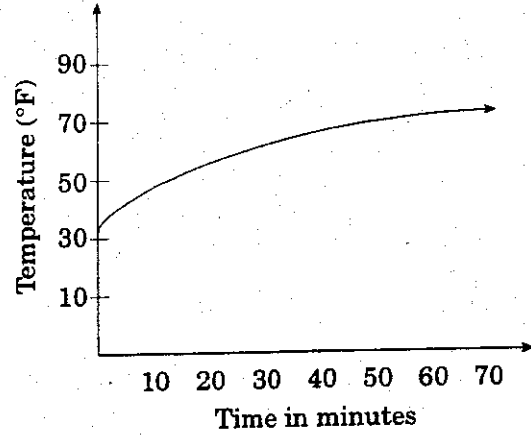
C
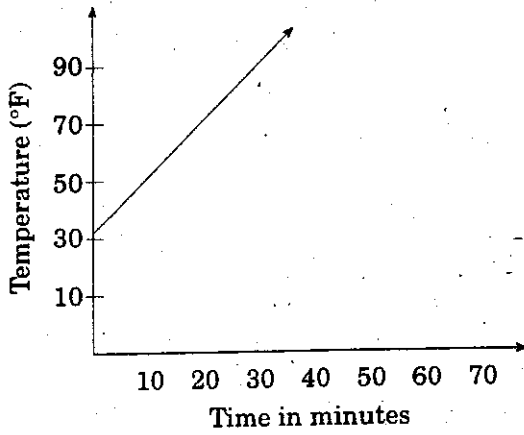
D
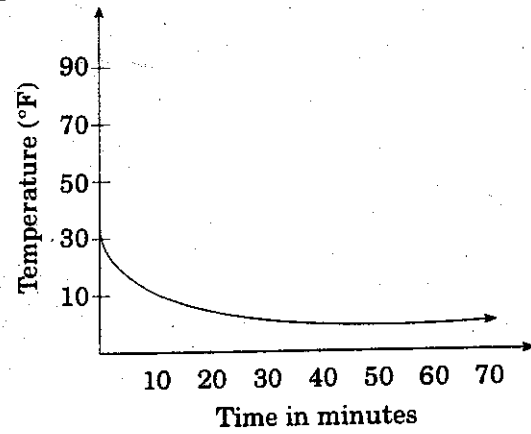
6.   Which graph *best* represents the relationship between the age of a car and its resale value?

Used Car Survey

A

Used Car Survey

B

Used Car Survey

C

Used Car Survey

D
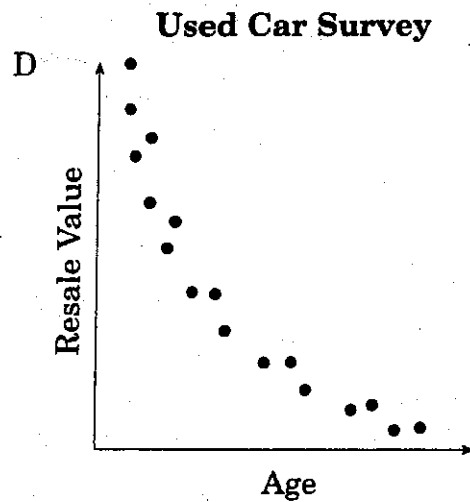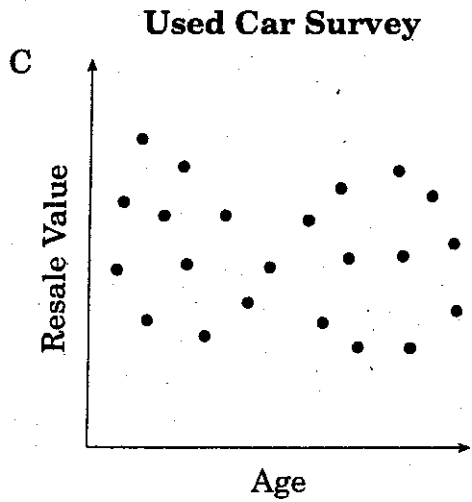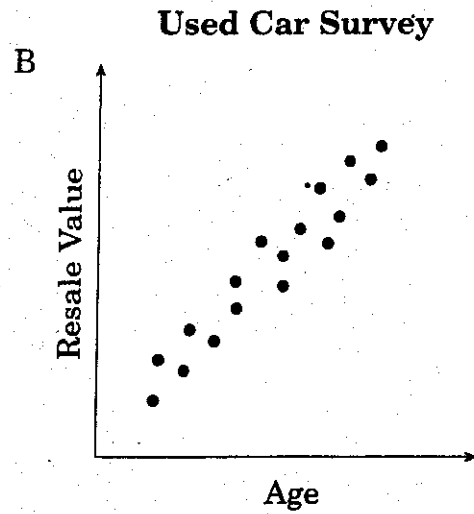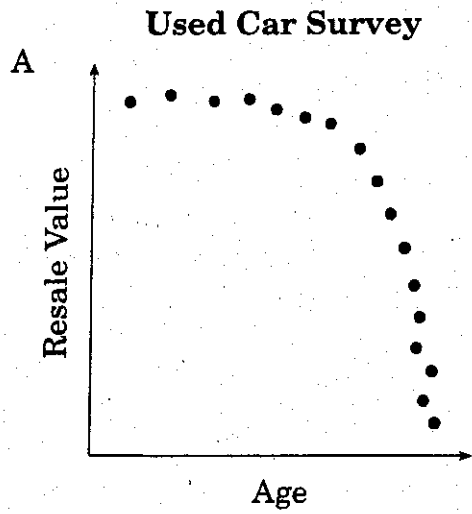
1. The graph for average total SAT scores for the United States, the Southeast Region, and North Carolina is provided below. Which score represents North Carolina's average score for 1994?

Average Total SAT Scores for the United States, the Southeast Region, and North Carolina: 1987-1994
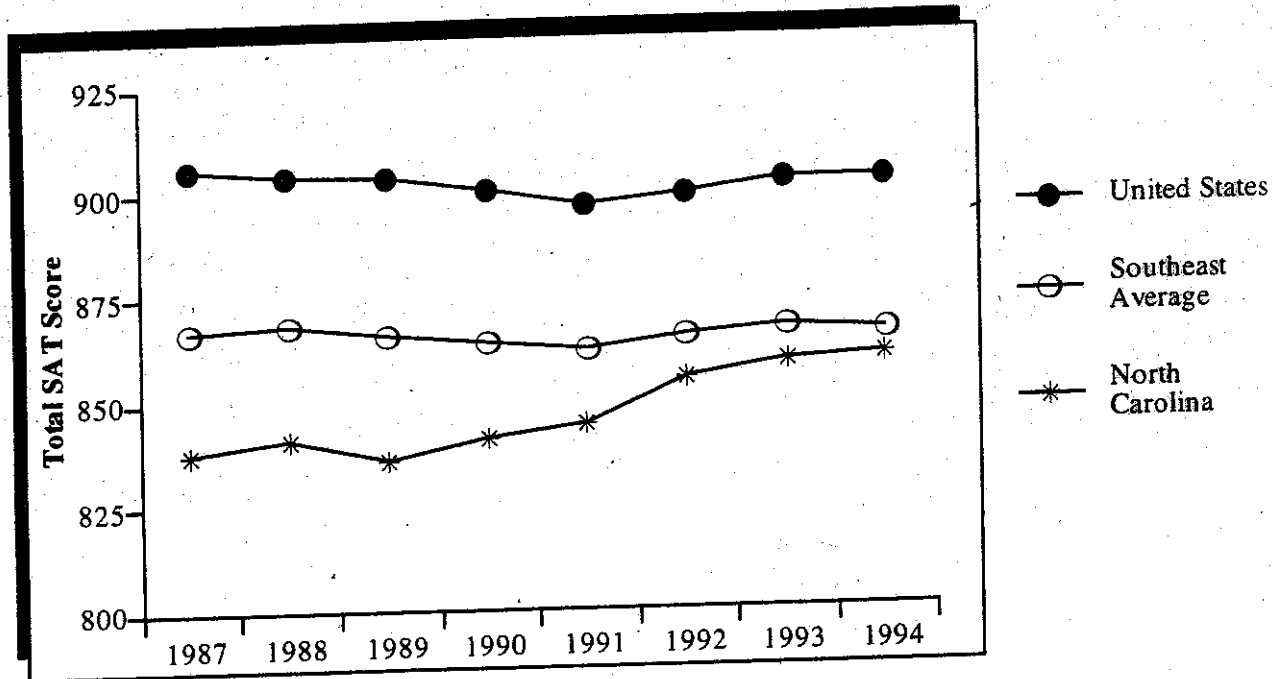
A   850

B   860

C   875

D   910

2. The graph below gives the temperature recorded at various times from 1 a.m. through 11 a.m. At which of the following times was the temperature 2 degrees below zero?
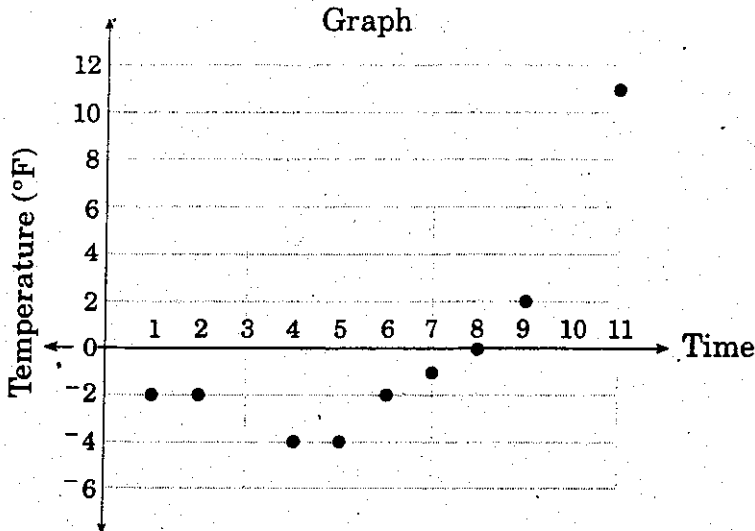
Graph

A   1 a.m.

B   5 a.m.

C   9 a.m.

D   11 a.m.

3. The graph shows the value of a dollar for any year between 1946 and 1993 relative to the 1993 dollar. According to the graph, the 1946 dollar could purchase 7.46 times as much as the dollar in 1993. During which ten-year period did the value of the dollar drop the *most*?

Relative Value of Dollar
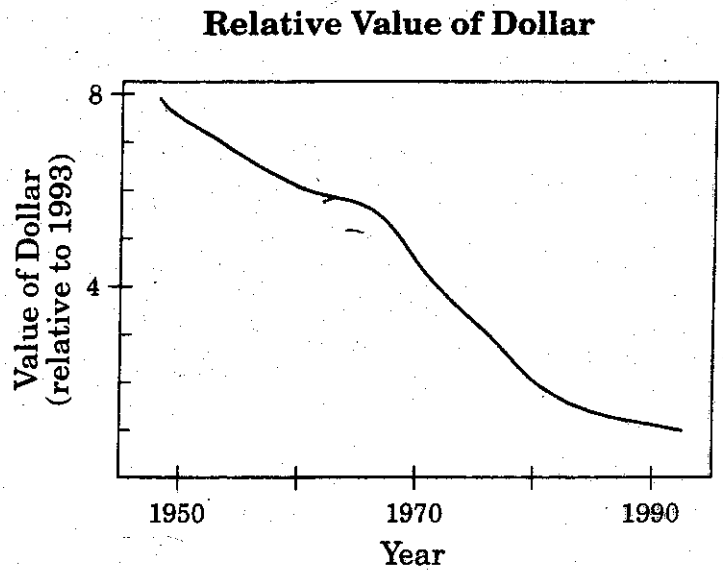
A   1950 - 1960

B   1960 - 1970

C   1970 - 1980

D   1980 - 1990

4. The graph represents a sand castle being washed away by the waves. What is the **approximate** height of the sand castle after 20 minutes?
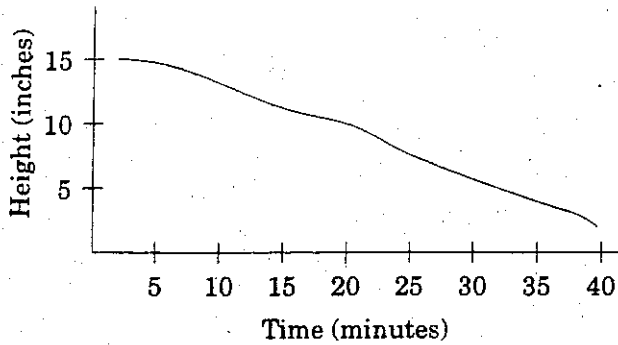
A   2 inches

B   7 inches

C   10 inches

D   12 inches

5. The graph of an elevator traveling from floor to floor appears below. How long does it take the elevator to travel from the third floor to the fifth floor?
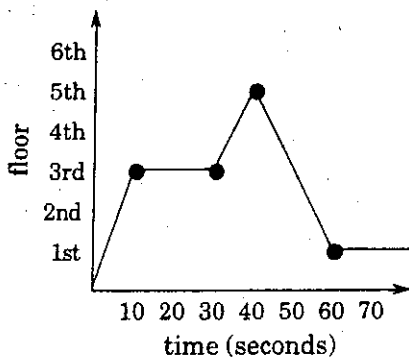
A   5 seconds

B   10 seconds

C   20 seconds

D   30 seconds

6. The graph shows how much ammonia will dissolve in 100 mL of water at various temperatures. At about which temperature will 45 mL of the ammonia dissolve?
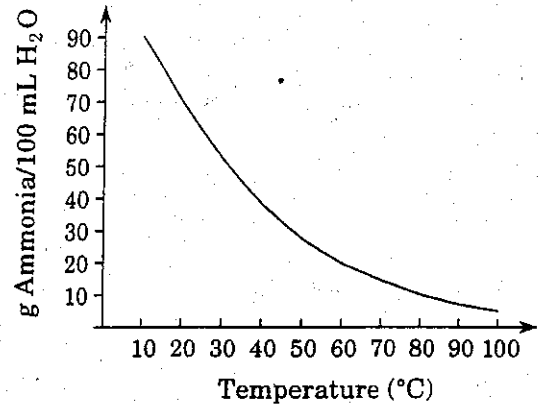
A   30°C

B   35°C

C   40°C

D   45°C

4.2   Function Notation

$$f(x) = 2(x+4)^2 - 7 \qquad g(x) = -x^2 + 3$$

Find

$$f(-2) \qquad f(n) \qquad f(x-6)$$

$$g(-6) \qquad g(a) \qquad g(x+5)$$

Do page 179 a-d, + pg 180 a-i

Domain:

Range:

(1,4)
(4,3)
(-2,1)
(5,-1)
(-4,5)
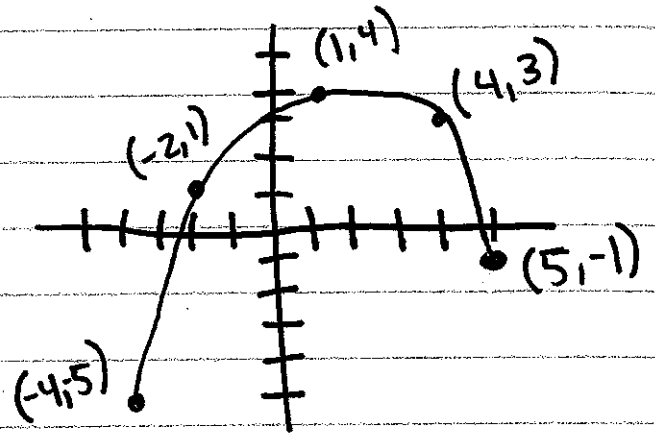
Find
$f(-2) =$ $f(5) =$

$f(4) - 8 =$ $f(-4) \cdot f(1) =$

do pg 181 1-4, 7, 8, 10, 13

4.2 cont.

Given $f(x) = x - 5$ $g(x) = x^2 - 8x + 15$
  Find
    $f \circ g(3) =$

    $f[g(3)] =$

    $g \circ f(-1) =$

    $3f(x) - 7g(x)$

    $\dfrac{g(x)}{f(x)} =$

Domain Restrictions
① variable in denominator
      set den $\neq 0$
        solve

② variable under sq root
      set $\sqrt{} \geq 0$
        solve

ex) $f(x) = \sqrt{8 - 3x}$

ex) $g(x) = 2x^2 + 5x - 1$

ex) $g(x) = \dfrac{3x + 7}{x^2 - x - 42}$

ex) $h(x) = \dfrac{4x}{\sqrt{2x + 6}}$

4.3 - Lines in Motion

$$y = (x + h) + K$$

movement to   movement to

HW: Worksheet

4.4 Translations in the Quad Family

Quadratic: 2nd degree function

parent function: $y = x^2$ or $f(x) = x^2$

Describe the translation:

$y = x^2 + 5$

$y = (x+7)^2 + 3$

$y = (x-4)^2$

Find the vertex (turning point)

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

$\quad v = (h, k)$

$\underline{\text{Ex}}$ $y = x^2 + 9$ $\qquad$ $\underline{\text{Ex}}$ $y = -3 + (x+11)^2$

$\underline{\text{Ex}}$ $y = (x+6)^2$

Find the translation of $y = x^2$ when you replace....

y with $y+6$

x with $x+8$

Solve by Square Root

① isolate square term

② take sq. root of both sides (use $\pm$)

③ Simplify

ex| $x^2 - 13 = 68$

ex| $(x-4)^2 - 3 = 7$

ex| $(x+7)^2 = 144$

4.5 Reflections

$$y = -(x)^2 \qquad y = (-x)^2 \qquad y = -(-x)^2$$

AFM Review 4.1-4.4
Notes for 4.5

Given $f(x) = 4x - 3$ $g(x) = -x^2 - 6x + 4$ $h(x) = -|3 - 2x| + 8$

$$j(x) = \sqrt{13x - 1} - 17$$

Find:
1. $f(7)$ 2. $h(-4)$ 3. $g(-9)$ 4. $j(2)$

5. $f(x + 2)$ 6. $g(x - 6)$

7. $f(5) + f(-2)$ 8. $g(-1) \bullet h(-5)$ 9. $f\{g[h(j(5))]\}$

10. find x when $f(x) = -75$ 11. find x when $j(x) = 14$ 12. find x when $g(x) = 12$

13. find x when $f(x - 2) = 17$ 14. find x when $j(x - 5) = 1$

Describe how each graph translates the graph of $y = f(x)$.

15. $y = f(x + 7)$ 16. $y = f(x) - 2$ 17. $y = f(x - 9) + 4$ 18. $y = f(x + 8) - 12$

(h, k)

Find the vertex of each parabola.

19. $y = x^2 - 3$ 20. $y = (x - 7)^2 + 6$ 21. $y = 5(x + 8)^2 + 4$ 22. $y = \frac{1}{3}(x - 2)^2 - 9$
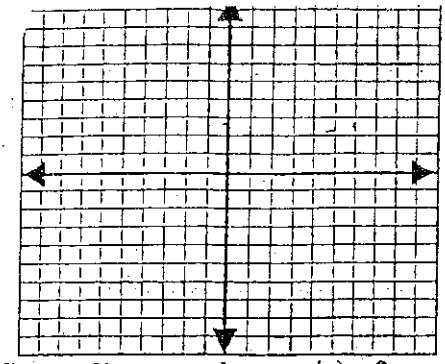
Solve:
23. $x^2 = 576$ 24. $x^2 - 7 = 282$ 25. $(x + 4)^2 + 8 = 177$ 26. $19 + (x - 9)^2 = 24$

Section 4.5 Reflections
Given the graph of f(x)
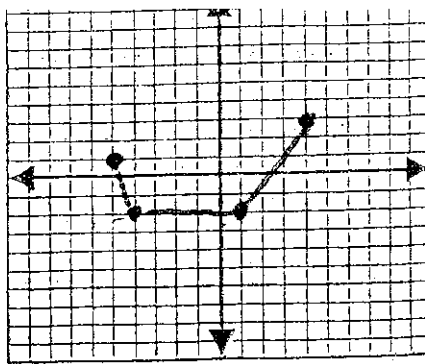
**-f(x) reflects (flips over the x-axis)
  *Graph –f(x)
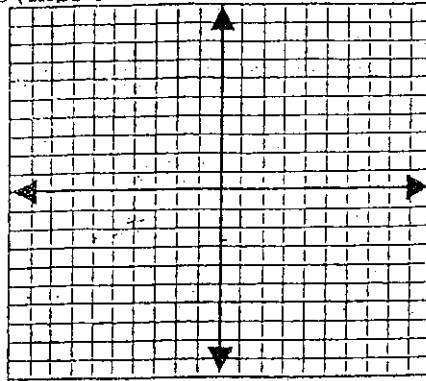
**f(-x) reflects (flips over the y-axis)
  *Graph f(-x)
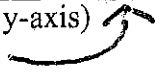
**-f(-x) reflects (flips over both the x-axis and the y-axis)
*Graph –f(-x).
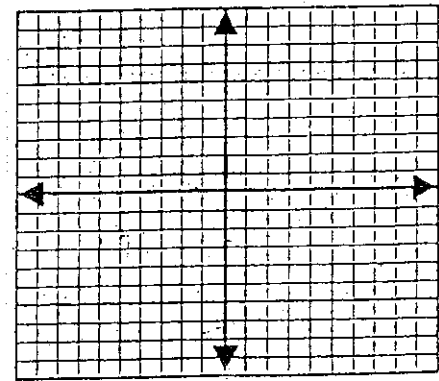
Solve each equation for y to get two separate functions, label each as Y_1 and Y_2. Then combine both functions to create a single relation that involves x and y.

a. $(y-3)^2 = x$

b. $y^2 = x + 9$

c. $(y+4)^2 = x - 5$

Use the function $h = -16t^2 + d$ to answer each question. (Round answers to the nearest hundredth of a second).

a. If a ball is dropped from a height of 700 feet, how long will it take to reach a height of 500 feet?

b. If a ball is dropped from a height of 900 feet, how long will it take to reach a height of 100 feet?

c. If a ball is dropped from a height of 120 feet, how long will it take to hit the ground?

AFM Section 4.6 Stretches and shrinks

$y = |x|$ is our parent function.

Vertical (up-down) $\qquad$ $y = a|x|$

When a > 1, then it's a vertical stretch by a factor of a.
If $0 < a < 1$, then it's a vertical shrink by a factor of a.
If a < 0, then it also reflects over the x-axis.

$\qquad$ EX. $y = 4|x|$ or $\dfrac{y}{4} = |x|$ is a vertical stretch by a factor of 4

$\qquad$ EX $y = \dfrac{1}{5}|x|$ or $5y = |x|$ is a vertical shrink by a factor of 5.

Horizontal (left-right) $y = |bx|$

When b > 1, then it's a horizontal shrink of a factor of b.
When $0 < b < 1$, then it's a horizontal stretch of a factor of b.
If b < 0, then it's also a reflection over the y-axis.

1. Enter $y = |x|$ in Y_1 Graph

Enter $y = \dfrac{1}{2}|x|$ in Y_2 Graph

What is/are the translation(s)?

2. Enter $y = |x|$ in Y_1 Graph

Enter $y = -3|x|$

What is/are the translation(s)?

3. Enter $y = |4x|$ in Y_2

What is/are the translation(s)?

4. Enter $y = \left|\dfrac{x}{5}\right|$ in Y_2

What is/are the translation(s)?

5. Enter $y = \dfrac{1}{6}|x + 8| - 3$

What are the translations?

6. $y = |-2(x + 5)| + 3$

What are the translations?

7. Enter $y = -|x - 4| - 2$

What are the translations?

8. Enter $y = \left|\dfrac{1}{4}(x - 2)\right| + 6$

What are the translations?

Finding the vertex of an absolute value function.
1. x-coordinate: set just absolute =0, drop absolute value, and solve for x
2. y-coordinate: number outside with ± sign

Find the vertex:

1. $y = -2\,|x + 8| + 7$

2. $y - 24 = \frac{1}{8}|3x + 15| - 6$

3. $\frac{y}{3} = |4x - 32| + 2$

4. $y + 7 = 8.2\left|\frac{x}{3}\right|$

5. $2y = -4\,|6 - 3x| + 18$

6. $y = -12\,|x|$

To solve absolute value equations.
Isolate the absolute value symbol
1. Algebraically: Two Equations
   a. Drop absolute value and solve
   b. Drop absolute value, change the sign on number past = and solve
   c. Check solutions
2. Use calculator – will not always show the exact answers
   a. Put isolated absolute value in Y_1
   b. Find <u>answers</u> in the table

Solve.

1. $6|5x| - 32 = 10$

2. $|x - 7| = 3$

3. $\left|\frac{2x}{9}\right| - 4 = 2$

4. $|x + 18| - 1 = 0$

5. $8\,|2x\text{-}12| + 49 = 1$

AFM-section 4.7

Solve each equation for y to get two separate equations that could be entered into a graphing calculator. In each case, label the two equations Y_1 and Y_2.
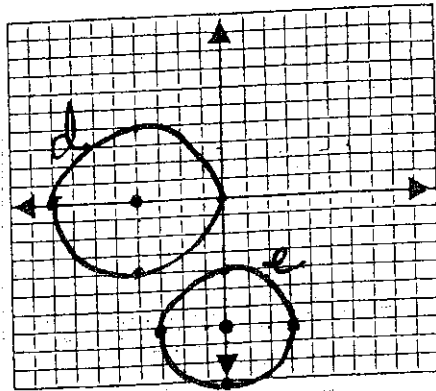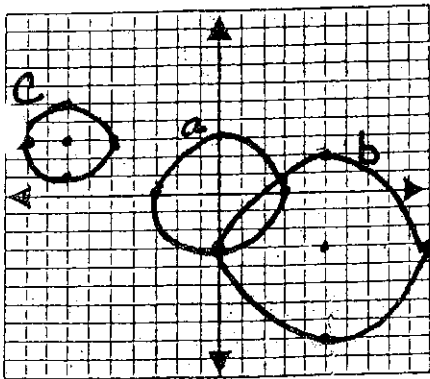
a. $x^2 + y^2 = 16$ b. $9x^2 + y^2 = 16$ c. $6x - 2y^2 = 1$

Write an equation of a circle (standard form) $(x - h)^2 + (y - k)^2 = r^2$

Center: (h, k)

Radius: $r = \sqrt{r^2}$.

a) _____

b) _____

c) _____

d) _____

e) _____

If $f(x) = \sqrt{16 - x^2}$, write an equation for each of the following related functions.

a. f(-x)   b. 5f(x)   c. f(3x)   d. -f(x)

x-intercept: substitute zero in for y and solve for x
y-intercept: substitute zero in for x and solve for y
Without graphing, find the x and y intercepts of the graph of each equation.

a. $x^2 + y^2 = 36$ b. $y = \sqrt{9 - x^2}$ c. $y = -\sqrt{25 - x^2}$

d. $y = 6\sqrt{1 - x^2}$ e. $y = -8\sqrt{49 - x^2}$ *f. $y = \sqrt{1 - (3x)^2}$

*g. $y = -4\sqrt{1 - \left(\dfrac{x}{4}\right)^2}$ *h. $y = 5\sqrt{16 - \left(\dfrac{x}{5}\right)^2}$

Unit circle: $x^2 + y^2 = 1$ Ellipse: $a > b$

Horizontal: $\dfrac{(x - h)^2}{a^2} + \dfrac{(y - k)^2}{b^2} = 1$

Or   Vertical: $\dfrac{(x - h)^2}{b^2} + \dfrac{(y - k)^2}{a^2} = 1$

Write an equation for each transformation of the unit circle, and identify the graph as a circle or ellipse. Then sketch the graph.

a Replace x with (x + 3)   b. Replace y with (y – 5)   c. Replace x with $\dfrac{x}{2}$

d. Replace y with $\dfrac{y}{8}$ e. Replace x with $\dfrac{x}{4}$ and y with $\dfrac{y}{6}$

4.8

Composition of functions:

$f \circ g(x)$ or $g \circ f(x)$

REWRITE AS

f[g(x)]   or   g[f(x)]

1. Start on the inside-substitute
2. Simplify
3. Substitute into the other function

EX.   f = (-2, 5), (0, -1), (-4, 2), (7, -3), (9, -6)
      g = (5, 0), (-1, 7), (-6, -2), (-3, -4), (2, 9)

find

$f \circ g(-6)$ $g \circ f(7)$ $g \circ f(x)$ $f \circ g(x)$

Given: $f(x) = -x^2 + 6x - 9$ $g(x) = 2x - 3$

Find

$f \circ g(x)$ $g \circ f(x)$

For each graph
a. find an equation for the graph
b. Write two functions, f and g, such that the figure is the graph of f[g(x)]