

Key

UCS JH Algebra I

SEM 2 REVIEW GUIDE #1

SUGGESTED QUESTIONS

- 1 Suppose you invest \$1500 in an account paying 4.75% annual interest. Find the account balance after 25 yr with the interest compounded the following ways.

$P = 1500$ $R = \frac{4.75}{1} = 4.75 = .0475$ $X = 25(1) = 25$ $1500(1.0475)^{25} = \$4785.64$	<p>a. annually</p> <p>b. semiannually</p> $P = 1500$ $R = \frac{4.75}{2} = 2.375 = .02375$ $X = 25(2) = 50$ $1500(1.02375)^{50} = \$4850.51$	<p>c. quarterly</p> $P = 1500$ $R = \frac{4.75}{4} = 1.1875 = .011875$ $X = 25(4) = 100$ $1500(1.011875)^{100} = \$4884.02$	<p>d. monthly</p> $P = 1500$ $R = \frac{4.75}{12} = .3958333 = .003958333$ $X = 25(12) = 300$ $1500(1.003958333)^{300} = \4906.79
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- 2 Describe each function as either a growth or decay. Explain which number represents the growth or decay, why? Explain what the other number in the function represents.

a) $f(x) = 9\left(\frac{1}{4}\right)^x$

decay $\frac{1}{4}$ is $0 < b < 1$

initial value = 9

$y = a(b)^x$ a = initial value

b) $f(x) = \frac{3}{4}(7)^x$

growth 7 is $b > 1$

initial value = $\frac{3}{4}$

- 3 In 2012 the population of Sterling Heights was 130,410. Its population is increasing by 1.6% per year. Write an equation to model the population growth of Sterling Heights since the year 2012.

$y = a \cdot b^x$
 $a = 130410$

$b = 100\% + 1.6\% = 101.6\% = 1.016$

$y = 130410(1.016)^x$

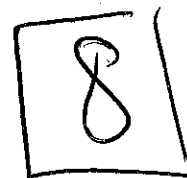
- 4 A rectangle has sides $a = 3x^2 + 5x - 1$ and $b = 3 - x$. If $P(x)$ is the perimeter of the rectangle, what is the coefficient of x in $P(x)$?

$P = 2l + 2w$

$2(3x^2 + 5x - 1) + 2(3 - x)$

$6x^2 + 10x - 2 + 6 - 2x$

$6x^2 + 8x + 4$



- 5 What is the greatest common factor of the terms of $10x^2y^3 - 25xy^4 + 40x^3y^2$?

$$5xy^2$$

- 6 A rectangular plot of land has an area of $2x^2 + 5x - 3$ square yards. What are the dimensions of the plot of land?

$$2x^2(-3) = -6x^2$$

$$\boxed{-x, 6x}$$

$$2x^2 - x + 6x - 3$$

$$x(2x-1) + 3(2x-1)$$

$$\boxed{(x+3)(2x-1)}$$

- 7 Write a quadratic function, in both standard and factored form, with x-intercepts at $x = 5$ and $x = -\frac{1}{2}$.

$$y = (x-5)(2x+1) \quad \text{Factored}$$

$$y = 2x^2 - 9x - 5 \quad \text{standard}$$

- 8 A quarterback throws a football across a field. The equation $y = -16x^2 + 20x + 6$ models the path of the ball while it is in the air, where y is the height of the ball in feet and x is the time in seconds. What is the maximum height reached by the ball?

$$x = \frac{-b}{2a}$$

$$x = \frac{-20}{2(-16)} = \frac{-20}{-32} = .625$$

y coord. of vertex!

$$y = -16(.625)^2 + 20(.625) + 6$$

$$= \boxed{12.25 \text{ ft}}$$

- 9 A rectangular flower box measures 7 feet by 5 feet. If each side of this flower box is extended by x feet, what will be the area of the new box?

$$(x+7)(x+5)$$

$$x^2 + 12x + 35$$

- 10 You are building a rectangular wading pool. You want the area of the bottom to be 90 ft². You want the length of the pool to be 3 ft longer than twice its width. What will the dimensions of the pool be?

Length: $2x+3 = 2(6)+3 = 15$

width: $x = 6$

$$A = l \cdot w$$

$$x(2x+3) = 90$$

$$2x^2 + 3x = 90$$

$$2x^2 + 3x - 90 = 0$$

$$2x^2 - 12x + 15x - 90 = 0$$

$$2x(x-6) + 15(x-6) = 0$$

$$2x^2(-90)$$

$$-180x^2$$

$$-1, 180$$

$$-2, 90$$

$$-3, 60$$

$$-4, 45$$

$$-5, 36$$

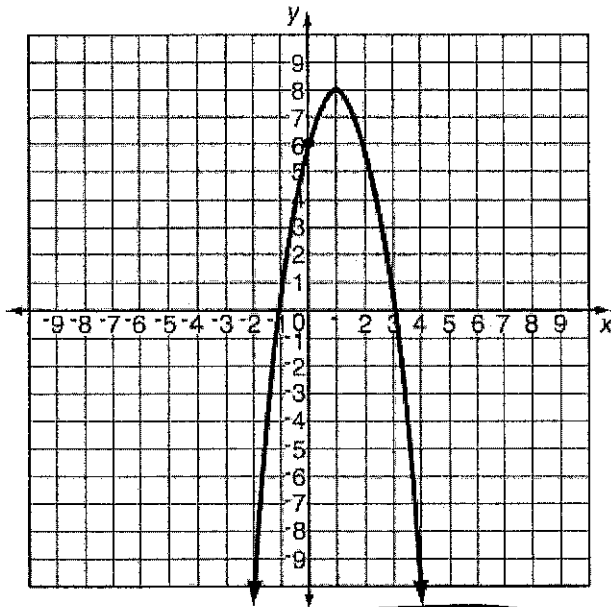
$$-6, 30$$

$$-9, 20$$

$$-10, 18$$

$$\boxed{-12, 15}$$

- 11 What is the vertex form of the equation of the function graphed below?



$$(2x+15)(x-6) = 0$$

$$2x+15=0 \quad x-6=0$$

$$x = -\frac{15}{2} \quad x=6$$

Vertex = (1, 8) pt (0, 6)

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

$$6 = a(0-1)^2 + 8$$

$$6 = a + 8$$

$$a = -2$$

$$y = -2(x-1)^2 + 8$$

- 12 The volume of wax used in making a cylindrical candle is given by the formula $V = \pi r^2 h$. What is the height of the candle in terms of the volume and radius?

b) $f(x) = x^2 + 6x + 12$
 $x = \frac{-6 \pm \sqrt{6^2 - 4(1)(12)}}{2(1)}$

$$V = \frac{4\pi r^2 h}{4\pi r^2}$$

$$h = \frac{V}{4\pi r^2}$$

$x = \frac{-6 \pm \sqrt{36}}{2}$ $x = \frac{-6 \pm \sqrt{12}}{2}$ $x = \frac{-6 \pm 2i\sqrt{3}}{2}$ $x = -3 \pm i\sqrt{3}$

- 13 Find the solutions to the following equation:

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

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

$$x = \frac{8 \pm \sqrt{(-8)^2 - 4(1)(5)}}{2(1)}$$

$x = \frac{8 \pm \sqrt{44}}{2}$ $x = \frac{8 \pm \sqrt{4}\sqrt{11}}{2}$ $x = \frac{8 \pm 2\sqrt{11}}{2}$

$$x = 4 \pm \sqrt{11}$$

$$x = 7.32, .68$$

- 14 Below is the formula for figuring the time it takes for an object to fall when dropped. The time in seconds is represented by t , and s is the height in feet from which the object is dropped.

$$-16t^2 + s = 0$$

If you drop your least favorite music CD from a height of 40 feet, how long will it be before it hits the ground?

$$\begin{array}{r} -16t^2 + 40 = 0 \\ -40 \quad -40 \\ \hline -16t^2 = -40 \\ -16 \quad -16 \\ \hline t^2 = 5/2 \end{array}$$

$$t = \sqrt{5/2}$$

$$t = 1.58$$

- 15 The path of a golf ball can be modeled by the equation $y = -16x^2 + vx + c$, where v is the initial velocity, and c is the initial height. When will the ball hit the ground if the initial velocity is 20 ft/s and the initial height is 6 ft.

$$x = \frac{-20 \pm \sqrt{(20)^2 - 4(-16)(6)}}{2(-16)}$$

$$y = -16t^2 + 20t + 6$$

$$x = \frac{-20 + 28}{-32} = 1.5$$

$x = \frac{-20 \pm \sqrt{84}}{-32}$ $x = \frac{-20 \pm 28}{-32}$ $x = \frac{-20 + 28}{-32} = -.25$

16 Solve the following system of equations algebraically and check.

$$\begin{array}{r} x^2 + 3x + 4 = x + 7 \\ -x \quad -7 \quad -x \quad -7 \\ \hline \end{array}$$

$$x^2 + 2x - 3 = 0$$

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

$$y = x^2 + 3x + 4$$

$$y - x = 7 \quad y = x + 7$$

$$x + 3 = 0$$

$$x - 1 = 0$$

$$x = -3$$

$$x = 1$$

$$\boxed{(-3, 4) \quad (1, 8)}$$

$$y = -3 + 7 = 4$$

$$y = 1 + 7 = 8$$

17 Is the following data linear, quadratic, or neither? If linear or quadratic, find the function rule that models the data.

Quadratic

$$a = \frac{-16}{21} = -8$$

$$c = 6$$

$$y = ax^2 + bx + c$$

$$-2 = -8(1)^2 + b(1) + 6$$

$$-2 = -2 + b$$

$$b = 0$$

$$\boxed{y = -8x^2 + 6}$$

x	y
-2	-26
-1	-2
0	6
1	-2
2	-26

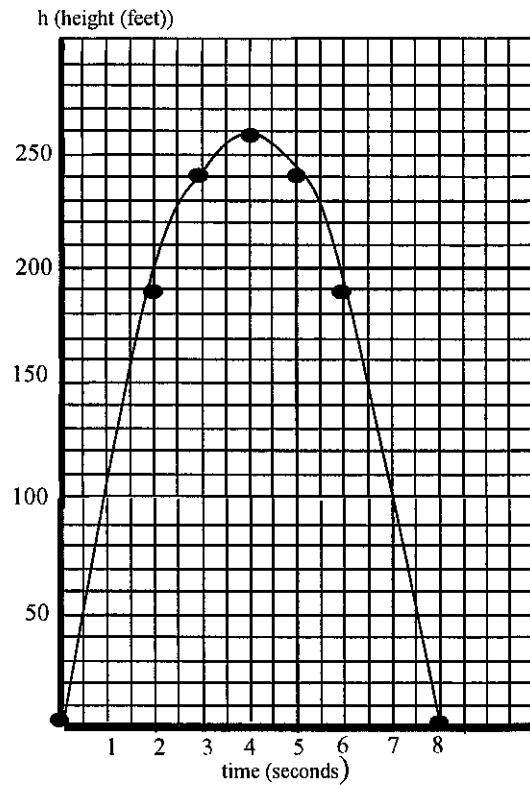
$$\left. \begin{array}{l} 24 \\ 8 \\ 8 \\ -24 \end{array} \right\} -16$$

18 Given the zeros of -5 and 3, find the following (assume a=1):

- a. Factored Form of the equation $y = (x+5)(x-3)$
- b. Standard Form of the equation $y = x^2 + 2x - 15$
- c. Coordinates of the Vertex $(-1, -16)$
- d. Vertex Form of the equation $y = (x+1)^2 - 16$
- e. Axis of Symmetry $x = -1$
- f. Is the Vertex a Max or Min min
- g. The y-intercept -15

$$c) x = \frac{-b}{2a} \quad x = \frac{-2}{2(1)} = -1 \quad y = (-1)^2 + 2(-1) - 15 = -16 \quad \text{Vertex } (-1, -16)$$

- 19 A student launches a rocket into the air. The parabola below shows the height of the rocket in feet. Write an expression to describe the domain for this situation.



$$0 \leq x \leq 8$$

OR

$$[0, 8]$$

- 20 What is the minimum point of the graph of the equation $f(x) = 2x^2 + 8x + 9$?

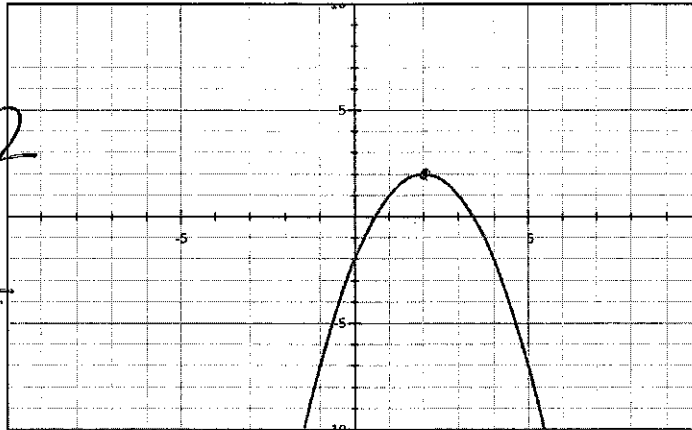
↓
vertex!

$$x = \frac{-8}{2(2)} = \frac{-8}{4} = -2$$

$$f(-2) = 2(-2)^2 + 8(-2) + 9 = 1$$

$$(-2, 1)$$

- 21 The graph of $f(x) = -x^2 + 4x - 2$ is shown below. Use the method of completing the square to re-write the equation in vertex form and identify the vertex and axis of symmetry.



$$x = \frac{-4}{2(-1)} = \frac{-4}{-2} = 2$$

$$-(2)^2 + 4(2) - 2 = 2$$

$$\text{Vertex} = (2, -2)$$

$$a = -1$$

$$\text{AOS } x = 2$$

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

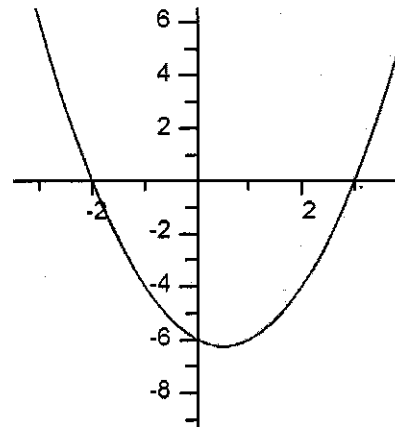
- 22 What could be a possible equation for the graph given the graph at the right?

Write the results in factored form and standard form.

$$x = 3 \quad x = -2$$

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

$$f(x) = x^2 - x - 6$$



- 23 Kara translated the parent function, $f(x) = x^2$. Write an equation for each situation below.

- a. up 10 units $f(x) = x^2 + 10$
 b. down 16 units $f(x) = x^2 - 16$
 c. wider than the parent function and opens up "a" must be $0 < a < 1$
 $y = \frac{1}{2}x^2$
 d. more narrow than the parent function and opens down, "a" must be $a < -1$
 $y = -2x^2$
 e. up 5 units and left 3 units $y = (x+3)^2 + 5$
 f. reflected over the x-axis $y = -x^2$

- 24 Write $\sqrt{-64} + 2$ as a complex number in the form $a + bi$.

$$\sqrt{64i^2} + 2$$

$$8i + 2$$

$$2 + 8i$$

- 25 What is the value of $\sqrt{40 - 89}$

$$\sqrt{-49}$$

$$\sqrt{49i^2} = 7i$$

- 26 What is the sum of the coefficients of the following polynomial:

$$f(x) = 3x^5 + 7x^3 - 8x^2 - x + 23$$

$$3 + 7 + -8 + -1$$

$$= 1$$

- 27 Factor $x^3 + 7x^2 - 18x$

$$x(x^2 + 7x - 18)$$

$$x(x+9)(x-2)$$

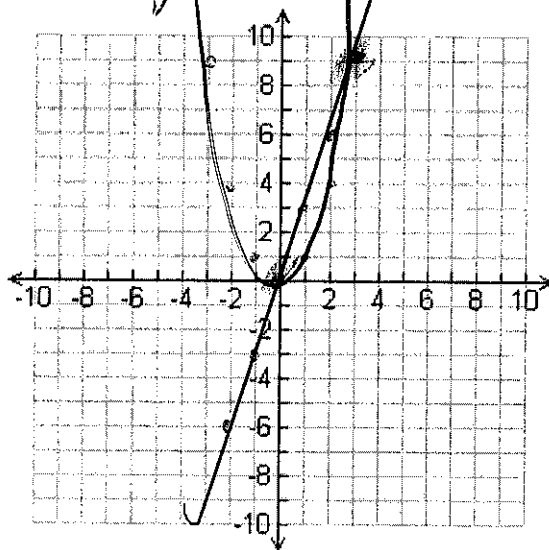
- 28 Graph these two functions on the coordinate plane and find the solutions.

$$\begin{cases} f(x) = x^2 \\ g(x) = 3x \end{cases}$$

$$m = \frac{3}{1}$$

$$b = 0$$

$$\left. \begin{matrix} (0, 0) \\ (3, 9) \end{matrix} \right\}$$



- 29 State the domain and range for the following function.

$$D: \mathbb{R}$$

$$\text{or } -\infty < x < \infty$$

$$R: 11 \leq y < \infty$$

$$\text{or } [11, \infty)$$

$$f(x) = 2x^2 - 8x + 19$$

$$x = \frac{8}{2(2)} = \frac{8}{4} = 2$$

$$2(2)^2 - 8(2) + 19$$

$$= 11$$

$$(2, 11)$$

- 30 Suppose a football player kicks a ball and gives it an initial upward velocity of 47 ft/s. The starting height of the football is 3 ft. Where is the football after 1 second? Where is the football after 2 seconds? When will the football hit the ground?

$$h = -16t^2 + 47t + 3.$$

$$1 \text{ sec: } -16(1)^2 + 47(1) + 3 = 34 \text{ ft}$$

$$2 \text{ sec: } -16(2)^2 + 47(2) + 3 = 33 \text{ ft}$$

$$x = \frac{-47 \pm \sqrt{47^2 - 4(-16)(3)}}{2(-16)}$$

$$x = \frac{-47 \pm \sqrt{2401}}{-32}$$

$$x = \frac{-47 + 49}{-32}$$

$$x = \frac{-47 + 49}{-32} = -0.625$$

$$x = \frac{-47 - 49}{-32} = 3 \text{ sec}$$

- 31 Solve using the Quadratic Formula:
 a. Write your answer in simplest radical form.
 b. Round your answer to the nearest hundredth.

$$X = \frac{-9 \pm 8.06}{-8}$$

a) $x = \frac{-9 \pm \sqrt{9^2 - 4(-4)(-1)}}{2(-4)}$

$$0 = -4x^2 + 9x - 1$$

$$x = \frac{-9 \pm \sqrt{65}}{-8}$$

$$X = 2.13, 0.12$$

- 32 Match each equation with the correct answers.

- B** 1. Crossing zeros: -2 Touching zeros: 6, -4 y-intercept: -16
D 2. Crossing zeros: 6, -4 Touching zeros: -2 y-intercept: -16
C 3. Crossing zeros: -6, 4 Touching zeros: 2 y-intercept: -8
A 4. Crossing zeros: 2 Touching zeros: -6, 4 y-intercept: -32

A $y = \frac{1}{36}(x+6)^2(x-2)(x-4)^2$

C $y = \frac{1}{12}(x+6)(x-2)^2(x-4)$

B $y = \frac{-1}{72}(x-6)^2(x+2)(x+4)^2$

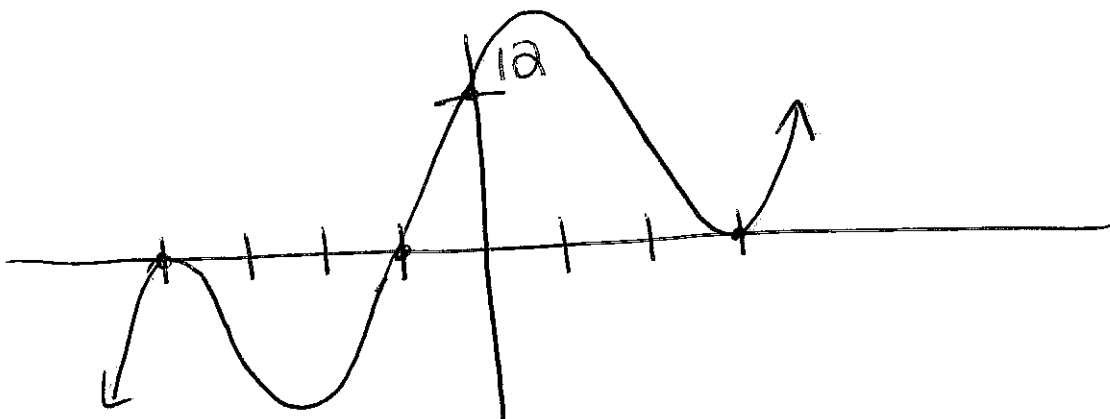
D $y = \frac{1}{6}(x-6)(x+2)^2(x+4)$

- 33 Given the equation $y = \frac{1}{12}(x+4)^2(x+1)(x-3)^2$

- a) State the crossing zeros $X = -1$
 b) State the touching zeros $X = -4$ $X = 3$
 c) State the end behavior pos odd $\downarrow \uparrow$ or
 d) State the y-intercept $\frac{1}{12}(4^2)(1)(3)^2 = 12$
 e) Sketch the graph

$$x \rightarrow -\infty, f(x) \rightarrow -\infty$$

$$x \rightarrow \infty, f(x) \rightarrow \infty$$



34 Since 1990, the population of Virginia has grown at an average annual rate of about 1%. In 1990, the population was about 6,284,000.

a. Write an equation to model the population growth in Virginia since 1990.

b. Suppose this rate of growth continues. Predict Virginia's population in 2010.

a) $y = 6284000(1.01)^x$

b) $y = 6284000(1.01)^{20} \approx 7667674$

35 Two functions are defined as follows: $f(x) = 100x$ and $g(x) = 2(3)^x$

For which integers, x , does the value of $g(x)$ exceed the value of $f(x)$?

x	1	2	3	4	5	6
$f(x)$	100	200	300	400	500	600
$g(x)$	6	18	54	162	486	1458

36 Simplify the following radical.

$$\frac{8}{\sqrt{72}} \sqrt{2} = \frac{8\sqrt{2}}{\sqrt{144}} = \frac{8\sqrt{2}}{12} = \frac{2\sqrt{2}}{3}$$

37 Solve the following quadratic equation.

$$4x^2 - 2x + 12 = 0$$

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

$$x = \frac{2 \pm \sqrt{-188}}{8} \quad x = \frac{2 \pm \sqrt{188}i}{8} \quad \frac{2 \pm \sqrt{4i^2} \sqrt{47}}{8} \quad x = \frac{2 \pm 2i\sqrt{47}}{8}$$

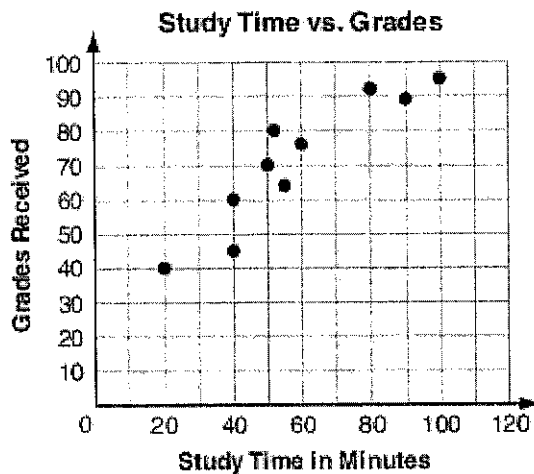
$$x = \frac{1 \pm i\sqrt{47}}{4}$$

38 Simplify the following radical.

$$\sqrt{180}$$
$$= 6\sqrt{5}$$

39 A table and a scatter plot of the same data showing the length of time several people studied for a test and the corresponding grade each of them received are shown below.

Time (min)	20	80	52	60	90	50	100	40	40	55
Grade (percent)	40	92	80	76	89	70	95	45	60	64

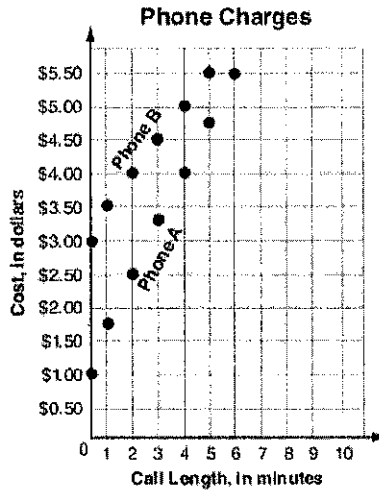


use graph. calc

$$y = .708x + 29.54$$
$$r^2 = .918$$

- Write the linear model for this relationship.
- What is the approximate correlation coefficient of the linear model for this relationship?

- 40 Both Adam and Bethany have cell phones, but they have different cell phone carriers. On Saturday, they each used their cell phones to call home. This graph shows Adam's phone (phone A) and Bethany's (phone B) cell phone charges for these calls.



$$A = .75X + 1$$

$$B = .50X + 3$$

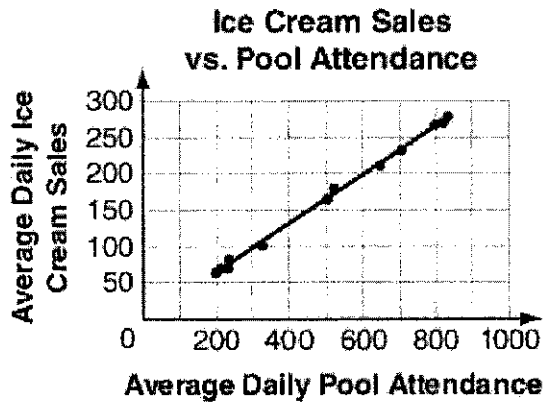
What is the difference between the charges per minute of the two cell phone carriers?

$$.75 - .50 = .25$$

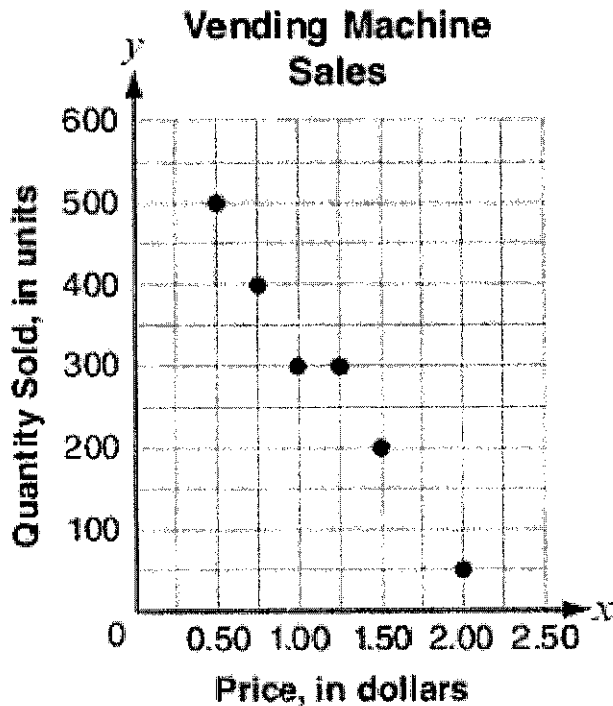
- 41 The table below show both Average Daily Ice Cream Sales and Average Daily Pool Attendance for a swimming center by month. The graph below shows Average Daily Ice Cream Sales versus Average Daily Pool Attendance. The correlation coefficient for this graph is 0.99. Is there a (1) causation or (2) correlation or (3) both or (4) neither?

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Average Daily Pool Attendance	212	234	328	508	704	821	834	798	648	522	231	198
Average Daily Ice Cream Sales	70	82	101	165	232	270	278	267	211	179	70	64

2



- 42 A vending machine owner tested different prices for a 20-ounce bottle of water to see how much profit could be made. This scatter plot shows the different prices and the quantity sold at each price.



Use the ordered pairs (0.50, 500) and (1.50, 200) to find the line of best fit. Use your equation to predict the quantity if the price is \$0.25.

$$m = \frac{500 - 200}{0.50 - 1.50} = \frac{300}{-1} = -300$$

$$y - 500 = -300(x - 0.50)$$

$$y - 500 = -300x + 150$$

$$y = -300x + 650$$

$$y = -300(0.25) + 650 = \$575$$