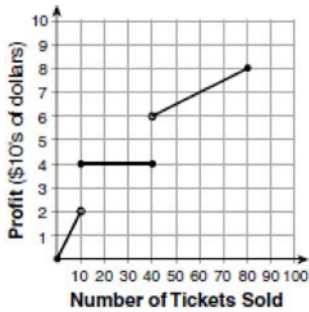
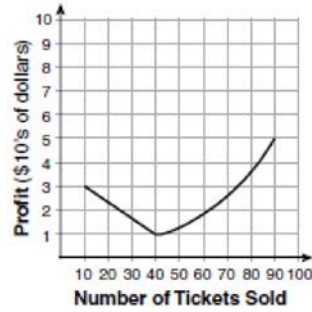


**0617AI**

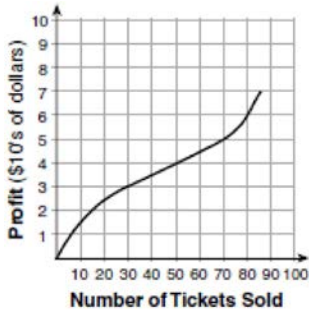
- 1 To keep track of his profits, the owner of a carnival booth decided to model his ticket sales on a graph. He found that his profits only declined when he sold between 10 and 40 tickets. Which graph could represent his profits?



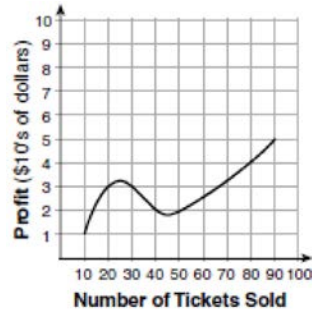
1)



3)



2)

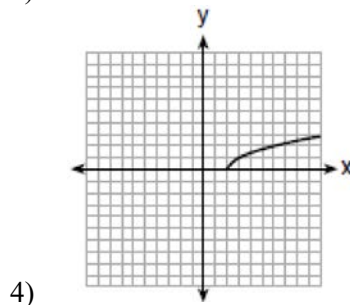
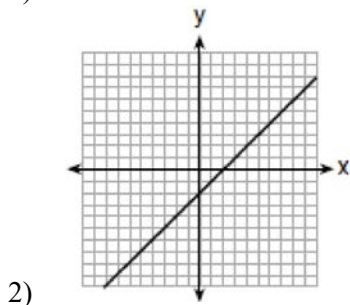
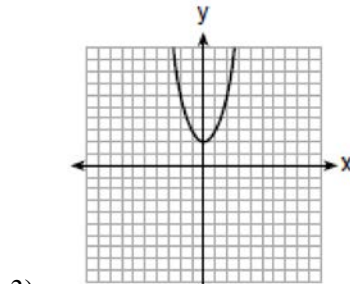
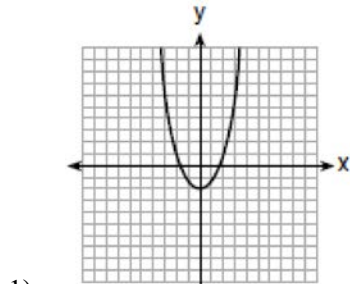


4)

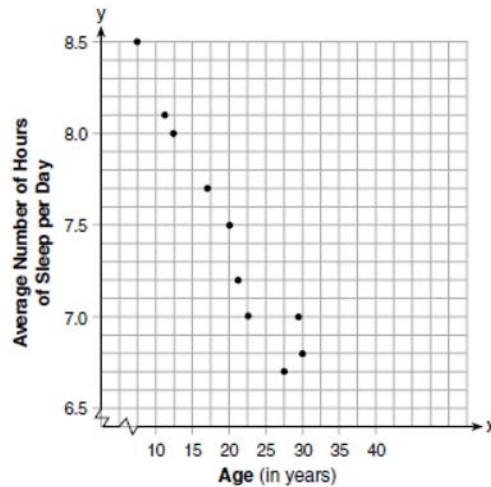
- 2 The formula for the surface area of a right rectangular prism is  $A = 2lw + 2hw + 2lh$ , where  $l$ ,  $w$ , and  $h$  represent the length, width, and height, respectively. Which term of this formula is *not* dependent on the height?

- |          |          |
|----------|----------|
| 1) $A$   | 3) $2hw$ |
| 2) $2lw$ | 4) $2lh$ |

3 Which graph represents  $y = \sqrt{x-2}$ ?



4 A student plotted the data from a sleep study as shown in the graph below.

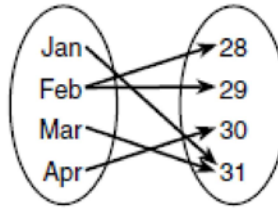


The student used the equation of the line  $y = -0.09x + 9.24$  to model the data. What does the rate of change represent in terms of these data?

- |  |   |
|--|---|
| 1) The average number of hours of sleep per day increases 0.09 hour per year of age. | 3) The average number of hours of sleep per day increases 9.24 hours per year of age. |
| 2) The average number of hours of sleep per day decreases 0.09 hour per year of age. | 4) The average number of hours of sleep per day decreases 9.24 hours per year of age. |



- 9 A mapping is shown in the diagram below.



This mapping is

- 1) a function, because Feb has two outputs, 28 and 29
- 2) a function, because two inputs, Jan and Mar, result in the output 31
- 3) not a function, because Feb has two outputs, 28 and 29
- 4) not a function, because two inputs, Jan and Mar, result in the output 31
- 10 Which polynomial function has zeros at  $-3$ ,  $0$ , and  $4$ ?
- 1)  $f(x) = (x + 3)(x^2 + 4)$
- 2)  $f(x) = (x^2 - 3)(x - 4)$
- 3)  $f(x) = x(x + 3)(x - 4)$
- 4)  $f(x) = x(x - 3)(x + 4)$
- 11 Jordan works for a landscape company during his summer vacation. He is paid \$12 per hour for mowing lawns and \$14 per hour for planting gardens. He can work a maximum of 40 hours per week, and would like to earn at least \$250 this week. If  $m$  represents the number of hours mowing lawns and  $g$  represents the number of hours planting gardens, which system of inequalities could be used to represent the given conditions?
- 1)  $m + g \leq 40$   
 $12m + 14g \geq 250$
- 2)  $m + g \geq 40$   
 $12m + 14g \leq 250$
- 3)  $m + g \leq 40$   
 $12m + 14g \leq 250$
- 4)  $m + g \geq 40$   
 $12m + 14g \geq 250$
- 12 Anne invested \$1000 in an account with a 1.3% annual interest rate. She made no deposits or withdrawals on the account for 2 years. If interest was compounded annually, which equation represents the balance in the account after the 2 years?
- 1)  $A = 1000(1 - 0.013)^2$
- 2)  $A = 1000(1 + 0.013)^2$
- 3)  $A = 1000(1 - 1.3)^2$
- 4)  $A = 1000(1 + 1.3)^2$
- 13 Which value would be a solution for  $x$  in the inequality  $47 - 4x < 7$ ?
- 1)  $-13$
- 2)  $-10$
- 3)  $10$
- 4)  $11$

14 Bella recorded data and used her graphing calculator to find the equation for the line of best fit. She then used the correlation coefficient to determine the strength of the linear fit. Which correlation coefficient represents the strongest linear relationship?

- 1) 0.9  
2) 0.5  
3) -0.3  
4) -0.8

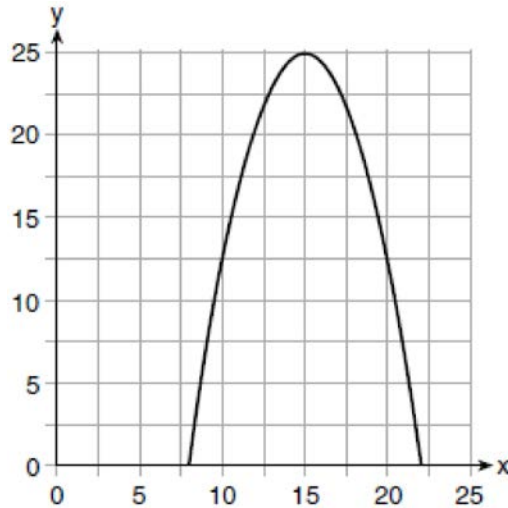
15 The heights, in inches, of 12 students are listed below.

61,67,72,62,65,59,60,79,60,61,64,63

Which statement best describes the spread of these data?

- 1) The set of data is evenly spread.  
2) The median of the data is 59.5.  
3) The set of data is skewed because 59 is the only value below 60.  
4) 79 is an outlier, which would affect the standard deviation of these data.

16 The graph of a quadratic function is shown below.



An equation that represents the function could be

- 1)  $q(x) = \frac{1}{2}(x + 15)^2 - 25$   
2)  $q(x) = -\frac{1}{2}(x + 15)^2 - 25$   
3)  $q(x) = \frac{1}{2}(x - 15)^2 + 25$   
4)  $q(x) = -\frac{1}{2}(x - 15)^2 + 25$

- 17 Which statement is true about the quadratic functions  $g(x)$ , shown in the table below, and  $f(x) = (x - 3)^2 + 2$ ?

x	g(x)
0	4
1	-1
2	-4
3	-5
4	-4
5	-1
6	4

- 1) They have the same vertex.  
 2) They have the same zeros.  
 3) They have the same axis of symmetry.  
 4) They intersect at two points.
- 18 Given the function  $f(n)$  defined by the following:

$$f(1) = 2$$

$$f(n) = -5f(n - 1) + 2$$

Which set could represent the range of the function?

- 1)  $\{2, 4, 6, 8, \dots\}$   
 2)  $\{2, -8, 42, -208, \dots\}$   
 3)  $\{-8, -42, -208, 1042, \dots\}$   
 4)  $\{-10, 50, -250, 1250, \dots\}$
- 19 An equation is given below.

$$4(x - 7) = 0.3(x + 2) + 2.11$$

The solution to the equation is

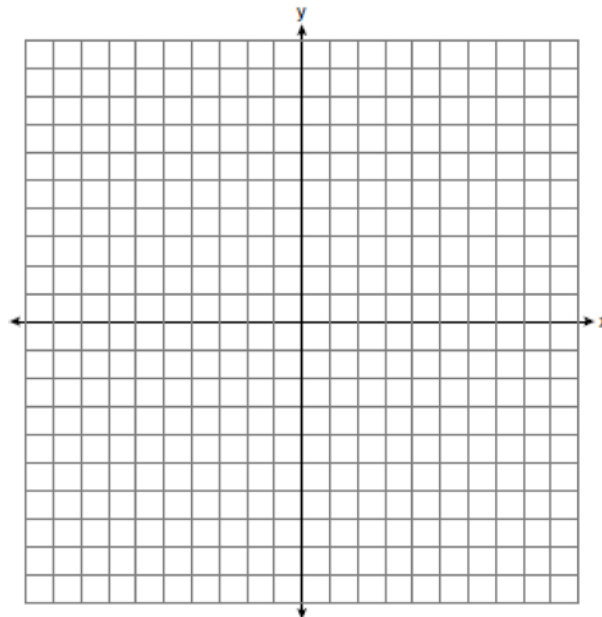
- 1) 8.3  
 2) 8.7  
 3) 3  
 4) -3
- 20 A construction worker needs to move  $120 \text{ ft}^3$  of dirt by using a wheelbarrow. One wheelbarrow load holds  $8 \text{ ft}^3$  of dirt and each load takes him 10 minutes to complete. One correct way to figure out the number of hours he would need to complete this job is
- 1)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{10 \text{ min}}{1 \text{ load}} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{1 \text{ load}}{8 \text{ ft}^3}$   
 2)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{60 \text{ min}}{1 \text{ hr}} \cdot \frac{8 \text{ ft}^3}{10 \text{ min}} \cdot \frac{1}{1 \text{ load}}$   
 3)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{1 \text{ load}}{10 \text{ min}} \cdot \frac{8 \text{ ft}^3}{1 \text{ load}} \cdot \frac{1 \text{ hr}}{60 \text{ min}}$   
 4)  $\frac{120 \text{ ft}^3}{1} \cdot \frac{1 \text{ load}}{8 \text{ ft}^3} \cdot \frac{10 \text{ min}}{1 \text{ load}} \cdot \frac{1 \text{ hr}}{60 \text{ min}}$
- 21 One characteristic of all linear functions is that they change by
- 1) equal factors over equal intervals  
 2) unequal factors over equal intervals  
 3) equal differences over equal intervals  
 4) unequal differences over equal intervals



- 27 State whether  $7 - \sqrt{2}$  is rational or irrational. Explain your answer.
- 28 The value,  $v(t)$ , of a car depreciates according to the function  $v(t) = P(.85)^t$ , where  $P$  is the purchase price of the car and  $t$  is the time, in years, since the car was purchased. State the percent that the value of the car *decreases* by each year. Justify your answer.
- 29 A survey of 100 students was taken. It was found that 60 students watched sports, and 34 of these students did not like pop music. Of the students who did *not* watch sports, 70% liked pop music. Complete the two-way frequency table.

	Watch Sports	Don't Watch Sports	Total
Like Pop			
Don't Like Pop			
Total			

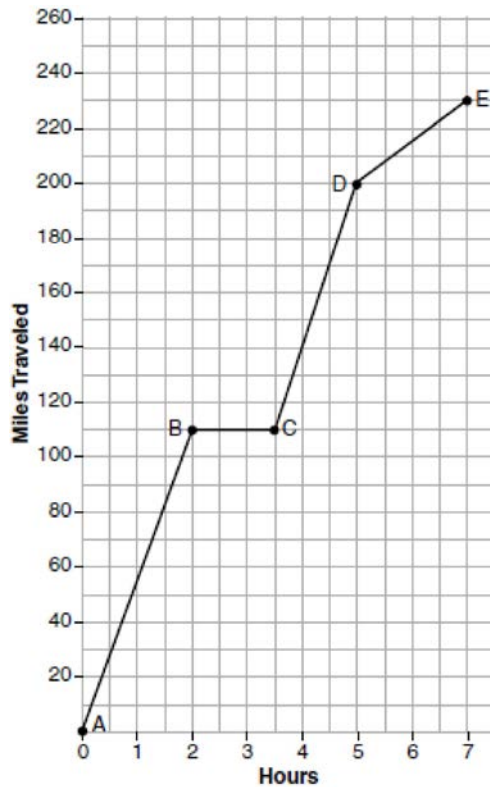
- 30 Graph the inequality  $y + 4 < -2(x - 4)$  on the set of axes below.



- 31 If  $f(x) = x^2$  and  $g(x) = x$ , determine the value(s) of  $x$  that satisfy the equation  $f(x) = g(x)$ .



- 32 Describe the effect that each transformation below has on the function  $f(x) = |x|$ , where  $a > 0$ .
- $$g(x) = |x - a|$$
- $$h(x) = |x| - a$$
- 33 The function  $r(x)$  is defined by the expression  $x^2 + 3x - 18$ . Use factoring to determine the zeros of  $r(x)$ . Explain what the zeros represent on the graph of  $r(x)$ .
- 34 The graph below models Craig's trip to visit his friend in another state. In the course of his travels, he encountered both highway and city driving.



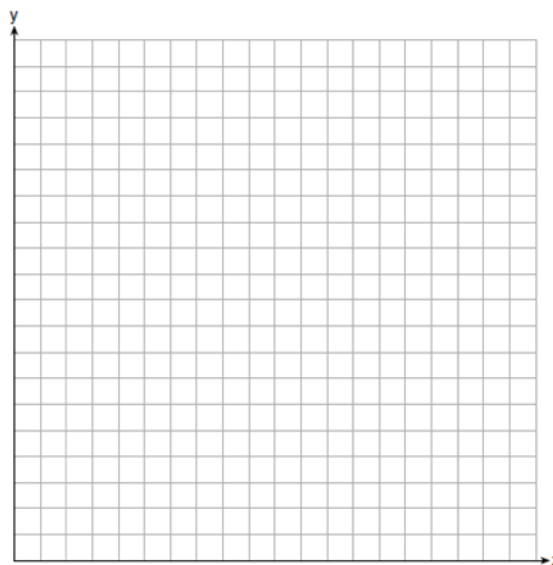
Based on the graph, during which interval did Craig most likely drive in the city? Explain your reasoning. Explain what might have happened in the interval between  $B$  and  $C$ . Determine Craig's average speed, to the nearest tenth of a mile per hour, for his entire trip.

35 Given:  $g(x) = 2x^2 + 3x + 10$

$$k(x) = 2x + 16$$

Solve the equation  $g(x) = 2k(x)$  algebraically for  $x$ , to the nearest tenth. Explain why you chose the method you used to solve this quadratic equation.

- 36 Michael has \$10 in his savings account. Option 1 will add \$100 to his account each week. Option 2 will double the amount in his account at the end of each week. Write a function in terms of  $x$  to model each option of saving. Michael wants to have at least \$700 in his account at the end of 7 weeks to buy a mountain bike. Determine which option(s) will enable him to reach his goal. Justify your answer.
- 37 Central High School had five members on their swim team in 2010. Over the next several years, the team increased by an average of 10 members per year. The same school had 35 members in their chorus in 2010. The chorus saw an increase of 5 members per year. Write a system of equations to model this situation, where  $x$  represents the number of years since 2010. Graph this system of equations on the set of axes below.



Explain in detail what each coordinate of the point of intersection of these equations means in the context of this problem.

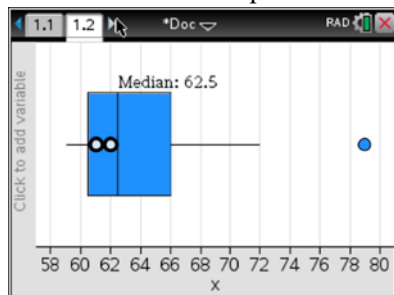
## 0617AI

## Answer Section

- 1 ANS: 3                   PTS: 2                   REF: 061701ai           NAT: F.IF.B.4  
TOP: Relating Graphs to Events
- 2 ANS: 2                   PTS: 2                   REF: 061702ai           NAT: A.SSE.A.1  
TOP: Dependent and Independent Variables
- 3 ANS: 4                   PTS: 2                   REF: 061703ai           NAT: F.IF.C.7  
TOP: Graphing Root Functions           KEY: bimodalgraph
- 4 ANS: 2                   PTS: 2                   REF: 061704ai           NAT: S.ID.C.7  
TOP: Modeling Linear Functions
- 5 ANS: 1  
 $f(3) = -2(3)^2 + 32 = -18 + 32 = 14$
- PTS: 2                   REF: 061705ai           NAT: F.IF.A.2           TOP: Functional Notation
- 6 ANS: 3                   PTS: 2                   REF: 061706ai           NAT: A.SSE.A.2  
TOP: Factoring the Difference of Perfect Squares           KEY: higher power
- 7 ANS: 1                   PTS: 2                   REF: 061707ai           NAT: F.LE.A.2  
TOP: Families of Functions
- 8 ANS: 1  
 $3(-2x + 2x + 8) = 12$   
 $24 \neq 12$
- PTS: 2                   REF: 061708ai           NAT: A.REI.C.6           TOP: Solving Linear Systems  
KEY: substitution
- 9 ANS: 3                   PTS: 2                   REF: 061709ai           NAT: F.IF.A.1  
TOP: Defining Functions           KEY: ordered pairs
- 10 ANS: 3                   PTS: 2                   REF: 061710ai           NAT: A.APR.B.3  
TOP: Zeros of Polynomials
- 11 ANS: 1                   PTS: 2                   REF: 061711ai           NAT: A.CED.A.3  
TOP: Modeling Systems of Linear Inequalities
- 12 ANS: 2                   PTS: 2                   REF: 061712ai           NAT: F.BF.A.1  
TOP: Modeling Exponential Functions
- 13 ANS: 4  
 $47 - 4x < 7$   
 $-4x < -40$   
 $x > 10$
- PTS: 2                   REF: 061713ai           NAT: A.REI.B.3           TOP: Interpreting Solutions
- 14 ANS: 1                   PTS: 2                   REF: 061714ai           NAT: S.ID.C.8  
TOP: Correlation Coefficient

15 ANS: 4

(1) The box plot indicates the data is not evenly spread. (2) The median is 62.5. (3) The data is skewed because the mean does not equal the median. (4) an outlier is greater than  $Q3 + 1.5 \cdot IRQ = 66 + 1.5(66 - 60.5) = 74.25$ .



PTS: 2 REF: 061715ai NAT: S.ID.A.3 TOP: Central Tendency and Dispersion

16 ANS: 4

Vertex (15,25), point (10,12.5)  $12.5 = a(10 - 15)^2 + 25$

$$-12.5 = 25a$$

$$-\frac{1}{2} = a$$

PTS: 2 REF: 061716ai NAT: F.IF.C.8 TOP: Vertex Form of a Quadratic

17 ANS: 3

$$x = 3$$

PTS: 2 REF: 061717ai NAT: F.IF.C.9 TOP: Comparing Functions

18 ANS: 2

$$f(1) = 2; f(2) = -5(2) + 2 = -8; f(3) = -5(-8) + 2 = 42; f(4) = -5(42) + 2 = -208$$

PTS: 2 REF: 061718ai NAT: F.IF.A.3 TOP: Sequences

KEY: recursive

19 ANS: 1

$$4(x - 7) = 0.3(x + 2) + 2.11$$

$$4x - 28 = 0.3x + 0.6 + 2.11$$

$$3.7x - 28 = 2.71$$

$$3.7x = 30.71$$

$$x = 8.3$$

PTS: 2 REF: 061719ai NAT: A.REI.B.3 TOP: Solving Linear Equations

KEY: decimals

20 ANS: 4 PTS: 2 REF: 061720ai NAT: N.Q.A.1

TOP: Conversions KEY: dimensional analysis

21 ANS: 3 PTS: 2 REF: 061721ai NAT: F.LE.A.1

TOP: Families of Functions

22 ANS: 2

$$x^2 - 8x + 16 = 10 + 16$$

$$(x - 4)^2 = 26$$

$$x - 4 = \pm\sqrt{26}$$

$$x = 4 \pm \sqrt{26}$$

PTS: 2 REF: 061722ai NAT: A.REI.B.4 TOP: Solving Quadratics

KEY: completing the square

23 ANS: 3 PTS: 2 REF: 061723ai NAT: A.CED.A.4

TOP: Transforming Formulas

24 ANS: 1

$$0 = -16t^2 + 24t$$

$$0 = -8t(2t - 3)$$

$$t = 0, \frac{3}{2}$$

PTS: 2 REF: 061724ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: context

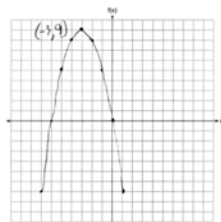
25 ANS:

$$5x^2 - 10$$

PTS: 2 REF: 061725ai NAT: A.APR.A.1 TOP: Operations with Polynomials

KEY: subtraction

26 ANS:



PTS: 2 REF: 061726ai NAT: F.IF.B.4 TOP: Graphing Quadratic Functions

KEY: no context

27 ANS:

$7 - \sqrt{2}$  is irrational because it can not be written as the ratio of two integers.

PTS: 2 REF: 061727ai NAT: N.RN.B.3 TOP: Operations with Radicals

KEY: classify

28 ANS:

$1 - 0.85 = 0.15 = 15\%$  To find the rate of change of an equation in the form  $y = ab^x$ , subtract  $b$  from 1.

PTS: 2 REF: 061728ai NAT: F.LE.B.5 TOP: Modeling Exponential Functions

29 ANS:

	Watch Sports	Don't Watch Sports	Total
Like Pop	26	28	54
Don't Like Pop	34	12	46
Total	60	40	100

PTS: 2

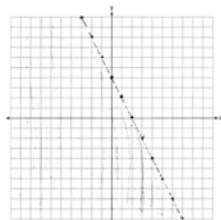
REF: 061729ai

NAT: S.ID.B.5

TOP: Frequency Tables

KEY: two-way

30 ANS:



$$y < -2x + 4$$

PTS: 2

REF: 061730ai

NAT: A.REI.D.12

TOP: Graphing Linear Inequalities

31 ANS:

$$x^2 = x$$

$$x^2 - x = 0$$

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

$$x = 0, 1$$

PTS: 2

REF: 061731ai

NAT: A.REI.D.11

TOP: Quadratic-Linear Systems

32 ANS:

$g(x)$  is  $f(x)$  shifted right by  $a$ ,  $h(x)$  is  $f(x)$  shifted down by  $a$ .

PTS: 2

REF: 061732ai

NAT: F.BF.B.3

TOP: Graphing Absolute Value Functions

33 ANS:

$$x^2 + 3x - 18 = 0 \quad \text{The zeros are the } x\text{-intercepts of } r(x).$$

$$(x + 6)(x - 3) = 0$$

$$x = -6, 3$$

PTS: 4

REF: 061733ai

NAT: A.APR.B.3

TOP: Zeros of Polynomials

34 ANS:

$D-E$ , because his speed was slower. Craig may have stayed at a rest stop during  $B-C$ .  $\frac{230-0}{7-0} \approx 32.9$

PTS: 4

REF: 061734ai

NAT: F.IF.B.4

TOP: Relating Graphs to Events

35 ANS:

$$2x^2 + 3x + 10 = 4x + 32 \quad x = \frac{1 \pm \sqrt{(-1)^2 - 4(2)(-22)}}{2(2)} \approx -3.1, 3.6. \text{ Quadratic formula, because the answer must be}$$

$$2x^2 - x - 22 = 0$$

to the nearest tenth.

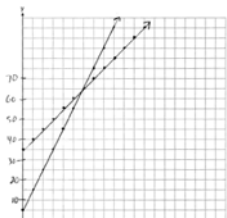
PTS: 4 REF: 061735ai NAT: A.REI.D.11 TOP: Quadratic-Linear Systems

36 ANS:

$$f(x) = 10 + 100x, g(x) = 10(2)^x; \text{ both, since } f(7) = 10 + 100(7) = 710 \text{ and } g(7) = 10(2)^7 = 1280$$

PTS: 4 REF: 061736ai NAT: F.LE.A.3 TOP: Families of Functions

37 ANS:


 $y = 10x + 5$  In 2016, the swim team and chorus will each have 65 members.

$$y = 5x + 35$$

PTS: 6 REF: 061737ai NAT: A.REI.C.6 TOP: Graphing Linear Systems