

PRACTICE EXAM 41

NY REGENTS ALGEBRA I

SIMULATION — 35 QUESTIONS

Recommended Time: 3 Hours

Required Tools: Graphing Calculator, Straightedge

Directions: Answer all 35 questions. For Part I, record answers on your answer sheet. For Parts II, III, and IV, show all work in the space provided. Partial credit is available on Parts II–IV.

PART I — Multiple Choice (Questions 1–24)

Each correct answer is worth 2 credits. No partial credit. No penalty for guessing.

1. Solve the equation $(x/3) + 4 = 10$ for x .

A. $x = 2$

B. $x = 18$

C. $x = 42$

D. $x = 6$

2. If $g(x) = 3x^2 + 2x - 5$, what is the value of $g(-1)$?

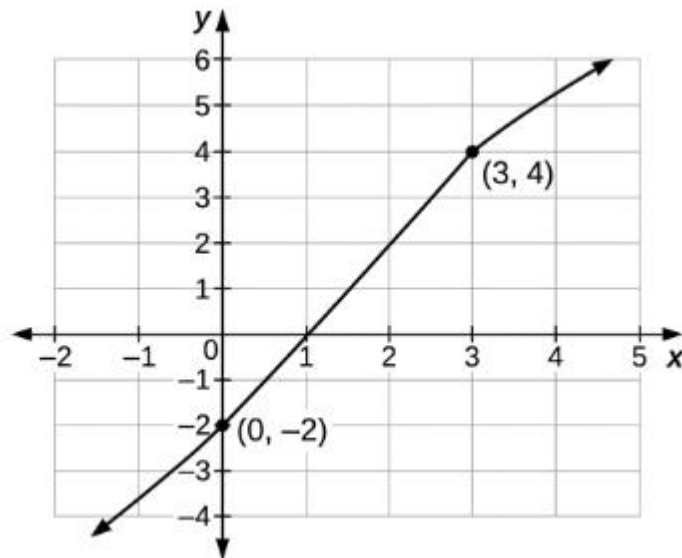
A. $g(-1) = 0$

B. $g(-1) = 6$

C. $g(-1) = -10$

D. $g(-1) = -4$

3. The graph below shows a line in the coordinate plane. What is the slope of the line?



A. 2

B. $1/2$

C. -2

D. 3

4. Which expression is the completely factored form of $x^2 - x - 20$?

A. $(x - 4)(x + 5)$

B. $(x - 10)(x + 2)$

C. $(x - 5)(x + 4)$

D. $(x - 20)(x + 1)$

5. A 600 mg sample of a substance decays by 20% each hour. Which function models the amount A remaining after h hours?

A. $A(h) = 600(1.20)^h$

B. $A(h) = 600(0.80)^h$

C. $A(h) = 600(0.20)^h$

D. $A(h) = 600 - 0.20h$

6. What are the solutions to the equation $x^2 + 4x - 1 = 0$, to the nearest hundredth?

A. $x \approx 0.24$ and $x \approx -4.24$

B. $x \approx 1.24$ and $x \approx -5.24$

C. $x \approx -0.24$ and $x \approx 4.24$

D. $x \approx 4.24$ and $x \approx 0.24$

7. A geometric sequence begins 2, 6, 18, 54, ... Which explicit formula represents the n th term?

A. $a_n = 2 + 3(n - 1)$

B. $a_n = 3(2)^{(n - 1)}$

C. $a_n = 2 + 6(n - 1)$

D. $a_n = 2(3)^{(n - 1)}$

8. Which inequality represents the solution to $-1 \leq 2x + 3 < 9$?

A. $-2 < x \leq 3$

B. $2 \leq x < 6$

C. $-2 \leq x < 3$

D. $-4 \leq x < 6$

9. What is the value of y in the solution to the system $2x + 3y = 12$ and $2x - y = 4$?

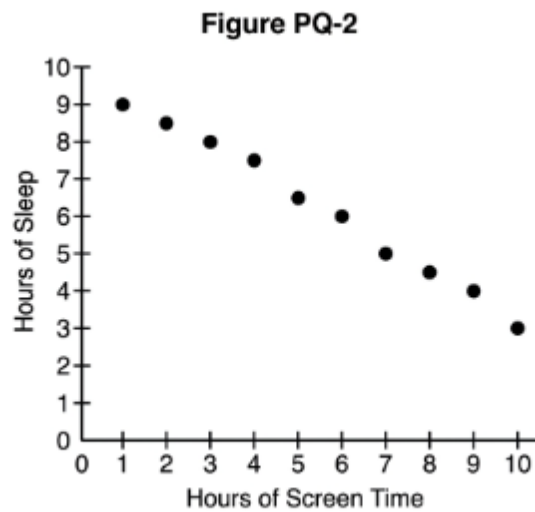
A. $y = 4$

B. $y = 2$

C. $y = 3$

D. $y = 1$

10. The scatter plot below shows the relationship between two variables. Which statement best describes the association?



A. There is a strong negative association between the variables

B. There is a strong positive association between the variables

C. There is no association between the variables

D. There is a weak positive association between the variables

11. Which expression is equivalent to $(2x - 3)(x + 5)$?

A. $2x^2 - 15$

B. $2x^2 + 13x - 15$

C. $2x^2 + 7x - 15$

D. $2x^2 - 7x - 15$

12. Which statement best describes the transformation from $f(x) = x^2$ to $g(x) = -x^2$?

A. a vertical stretch by a factor of -1

B. a horizontal shift left 1 unit

C. a reflection over the y-axis

D. a reflection over the x-axis

13. A line passes through the points (2, 1) and (4, 7). Which equation represents this line?

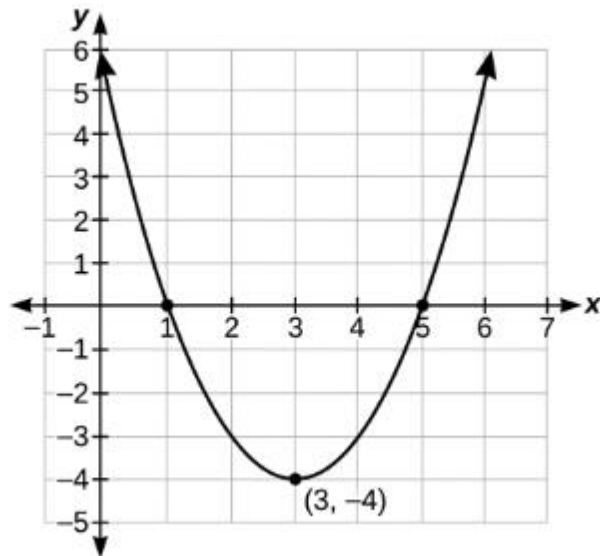
A. $y = 3x + 1$

B. $y = 3x - 5$

C. $y = (1/3)x - 5$

D. $y = 3x - 7$

14. The graph of a quadratic function is shown below. What are the coordinates of the vertex?



A. (3, -4)

B. (-3, -4)

C. (3, 4)

D. (-4, 3)

15. A ball is thrown upward, and its height is modeled by $h(t) = -16t^2 + 32t + 5$, where t is the time in seconds. Which is the most appropriate domain for this situation?

A. all real numbers, since t can be any value

B. $t \geq 0$, with no upper limit on the time

C. $-5 \leq t \leq 5$, centered on the launch point

D. $0 \leq t \leq 2.15$, approximately, until it lands

16. A line of best fit for a data set is given by $\hat{y} = 1.8x + 12$. For a data point at $x = 10$, the actual measured value is 25. What is the residual for this point?

A. residual = 13

B. residual = 5

C. residual = -5

D. residual = 30

17. Which of the following expressions results in an irrational number?

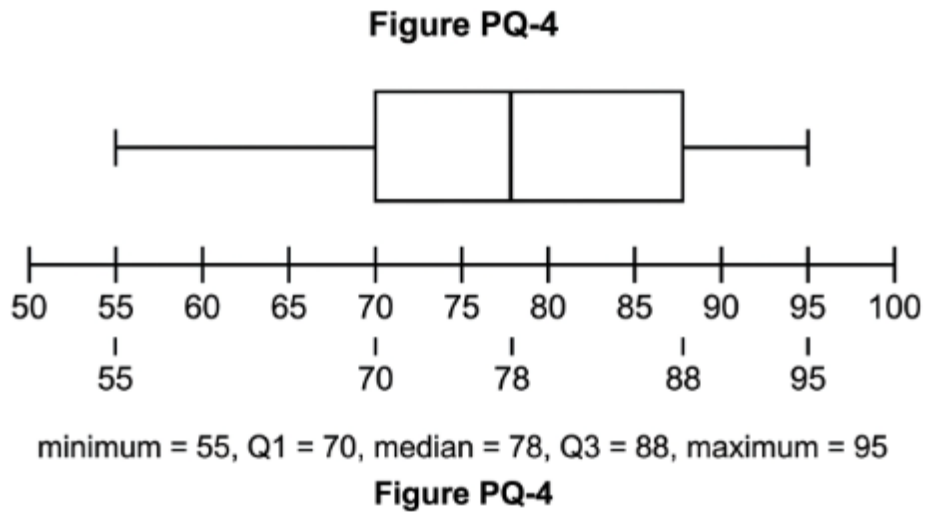
A. $\sqrt{2} + 5$

B. 0.3333... repeating forever

C. $\sqrt{16} + 3$

D. $\frac{7}{9}$ written as a fraction

18. The box plot below summarizes a set of test scores. Between which two values do the middle 50% of the scores lie?



A. between 55 and 95

B. between 70 and 88

C. between 78 and 95

D. between 55 and 78

19. Which system of equations has infinitely many solutions?

A. $y = 2x + 3$ and $y = 2x - 3$

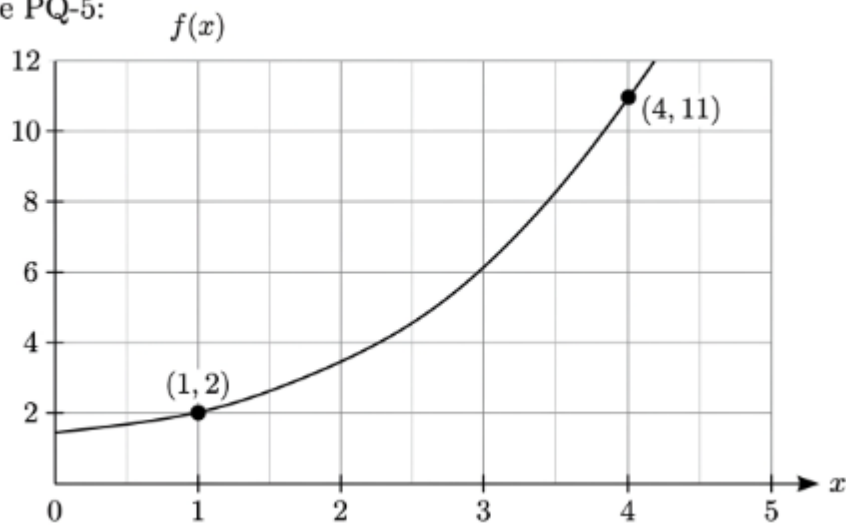
B. $y = x + 1$ and $y = -x + 1$

C. $2x + y = 5$ and $4x + 2y = 8$

D. $2x + y = 5$ and $4x + 2y = 10$

20. The graph of the function $f(x)$ is shown below. What is the average rate of change of $f(x)$ over the interval $1 \leq x \leq 4$?

Figure PQ-5:



A. 9

B. $13/5$

C. 3

D. $1/3$

21. What value of c makes the expression $x^2 + 12x + c$ a perfect-square trinomial?

A. $c = 36$

B. $c = 6$

C. $c = 12$

D. $c = 144$

22. Two functions are defined as $f(x) = 2x + 10$ and $g(x) = 2^x$. For large values of x , which statement is true?

A. $f(x)$ will always be greater than $g(x)$

B. $f(x)$ and $g(x)$ increase at the same constant rate

C. $g(x)$ will eventually exceed and remain greater than $f(x)$

D. $g(x)$ will always be less than $f(x)$ for all x

23. Two classes took the same quiz. Class X scored 80, 82, 81, 79, 78. Class Y scored 60, 95, 70, 100, 75. Which statement about the two data sets is true?

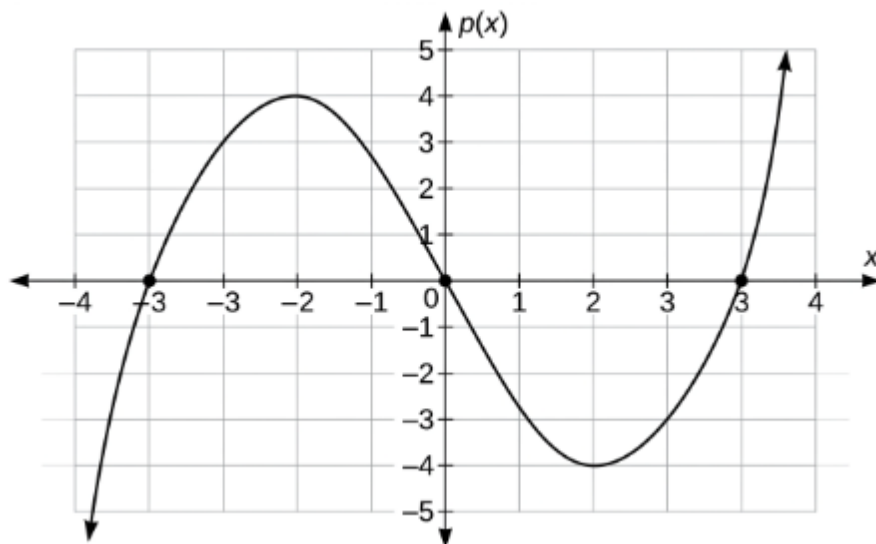
A. Class Y has a smaller standard deviation than Class X

B. Class X has a smaller standard deviation than Class Y

C. Both classes have exactly the same standard deviation

D. Class X has a higher mean score than Class Y

24. The graph of the function $p(x)$ is shown below. How many real zeros does $p(x)$ have?



A. 0

B. 1

C. 2

D. 3

PART II — Short Constructed Response (Questions 25–32)

Each question is worth 2 credits. Show all work.

25. Solve the following system algebraically and verify your solution.

$$y = 3x - 2$$

$$2x + y = 8$$

26. Write the equation of the line that is parallel to $y = (3/4)x + 1$ and passes through the point $(8, -3)$. Express your answer in slope-intercept form.

27. Solve the quadratic equation $2x^2 + 5x - 3 = 0$ by factoring. Show all steps.

28. The table below shows the value of a savings account at the end of each year.

Year (t): 0, 1, 2, 3

Value (\$): 1000, 1100, 1210, 1331

Determine whether the data represent linear or exponential growth. Justify your answer, then write a function $V(t)$ that models the account value.

29. Factor the following expression completely: $5x^2 - 45$.

30. A geometric sequence has $a_1 = 4$ and $a_4 = 108$. Find the common ratio and write the explicit formula for the n th term.

31. Graph the solution set of the system of inequalities on a coordinate plane. State one point in the solution region and verify it satisfies both inequalities.

$$y \geq 2x - 4$$

$$y < -x + 5$$

32. A line of best fit for a data set is given by $\hat{y} = -3x + 50$. For a data point at $x = 6$, the observed value is 28. Calculate the residual and state whether the observed value lies above or below the line of best fit.

PART III — Medium Constructed Response (Questions 33–34)

Each question is worth 4 credits. Show all work.

33. Consider the quadratic function $f(x) = x^2 + 2x - 8$.

a. Find the vertex of the function using the axis of symmetry formula. Show your work.

b. Identify the zeros of $f(x)$ algebraically.

c. Describe the key features of the graph: direction of opening, vertex, axis of symmetry, x -intercepts, and y -intercept. State the minimum value of the function.

34. A taxi company charges a flat fee plus a fixed rate per mile. A 4-mile ride costs \$14, and a 9-mile ride costs \$29.

- Determine the rate charged per mile (the slope). Show your work.
- Write a linear function $C(m)$ that gives the total cost of a ride of m miles.
- Identify the flat fee and explain what it represents in this context.
- Use your function to determine the cost of a 15-mile ride. Show your calculation.

PART IV — Extended Constructed Response (Question 35)

This question is worth 6 credits. Show all work.

35. A model rocket is launched from a platform. Its height h (in feet) after t seconds is modeled by the function $h(t) = -16t^2 + 64t + 80$.

- Determine the height of the rocket at the moment it is launched ($t = 0$). Explain what this value represents.
- Find the maximum height the rocket reaches and the time at which it occurs. Use the axis of symmetry and show your work.
- Determine the time at which the rocket hits the ground. Solve algebraically and show all work.
- Create a table of values for $h(t)$ at $t = 0, 1, 2, 3, 4,$ and 5 seconds. Show your calculations.
- Over which time interval is the rocket rising, and over which interval is it falling? Justify your answer using your table or the vertex.

ANSWER KEY WITH EXPLANATIONS — PRACTICE EXAM 41

- B — $x = 18$. Subtracting 4 from both sides gives $x/3 = 6$, and multiplying both sides by 3 isolates $x = 18$. The variable is divided by 3, so the inverse operation of multiplication recovers its value. Substituting back yields $6 + 4 = 10$, confirming the result.

2. D — $g(-1) = -4$. Substituting -1 gives $3(-1)^2 + 2(-1) - 5 = 3 - 2 - 5 = -4$. The squared term produces $+3$ because $(-1)^2$ is positive, while the linear term contributes -2 . Correct order of operations is essential to avoid sign errors.
3. A — slope = 2. Using the two labeled points, $(4 - (-2))/(3 - 0) = 6/3 = 2$. Slope is the ratio of vertical change to horizontal change between any two points on the line. The positive value matches the upward direction of the graph.
4. C — $(x - 5)(x + 4)$. The factor pair of -20 that sums to -1 is -5 and $+4$, producing $(x - 5)(x + 4)$. Expanding returns $x^2 - x - 20$, confirming the factorization. Matching both the product and the sum of the constant term is required.
5. B — $A(h) = 600(0.80)^h$. A 20% decay means 80% of the amount remains each hour, so the base is $1 - 0.20 = 0.80$. A base between 0 and 1 produces exponential decay applied to the starting amount of 600. Repeated multiplication, not subtraction, models percentage decay.
6. A — $x \approx 0.24$ and $x \approx -4.24$. The quadratic formula gives $x = (-4 \pm \sqrt{20})/2 = -2 \pm \sqrt{5}$, where $\sqrt{5} \approx 2.236$. This yields approximately 0.24 and -4.24 , the two irrational roots. The discriminant 20 is positive but not a perfect square, so the solutions are irrational.
7. D — $a_n = 2(3)^{(n-1)}$. The sequence multiplies by a constant ratio of 3 each term, making it geometric with first term 2. The explicit form $a_1 \cdot r^{(n-1)}$ becomes $2(3)^{(n-1)}$. A constant ratio rather than a constant difference signals a geometric rule.
8. C — $-2 \leq x < 3$. Subtracting 3 from all three parts gives $-4 \leq 2x < 9 - 3 = 6$, and dividing by 2 yields $-2 \leq x < 3$. The inequality symbols are preserved because the divisor is positive. Both boundary conditions must carry through the full compound inequality.
9. B — $y = 2$. Subtracting the second equation from the first eliminates x : $(3y - (-y)) = 12 - 4$, giving $4y = 8$ and $y = 2$. Elimination works here because both equations share the term $2x$. The matching coefficient allows direct subtraction.
10. A — strong negative association. The points fall tightly along a clearly downward-sloping pattern, indicating both strength and a negative direction. As one variable increases, the other consistently decreases. Tight clustering near a line reflects a high-magnitude correlation.
11. C — $2x^2 + 7x - 15$. Multiplying gives $2x^2 + 10x - 3x - 15$, and combining the middle terms produces $2x^2 + 7x - 15$. Every term of the first binomial must distribute across the second. The $+7x$ results from $+10x$ and $-3x$.
12. D — a reflection over the x -axis. The negative sign in $g(x) = -x^2$ multiplies every output by -1 , flipping the parabola downward across the x -axis. Outputs change sign while inputs remain unchanged, which defines a reflection over the x -axis. A reflection over the y -axis would instead negate the input.
13. B — $y = 3x - 5$. The slope is $(7 - 1)/(4 - 2) = 6/2 = 3$, and substituting $(2, 1)$ gives $1 = 3(2) + b$, so $b = -5$. The line is therefore $y = 3x - 5$. Both points satisfy this equation, confirming the fit.
14. A — $(3, -4)$. The lowest point of the upward-opening parabola is the labeled vertex at $(3, -4)$. The vertex represents the minimum point where the curve changes direction. Its x -coordinate also marks the axis of symmetry.
15. D — $0 \leq t \leq 2.15$ approximately. Time begins at launch ($t = 0$) and ends when the ball lands, where height returns to zero near $t \approx 2.15$ seconds. Negative time and time after landing have no physical meaning for the height. Restricting the domain to the airborne interval makes the model realistic.

16. C — residual = -5 . The predicted value is $1.8(10) + 12 = 30$, and the residual equals actual minus predicted: $25 - 30 = -5$. A negative residual indicates the observed point lies below the line of best fit. Residuals measure the vertical gap between data and prediction.
17. A — $\sqrt{2} + 5$. Since $\sqrt{2}$ is irrational, adding the rational number 5 produces an irrational sum. A rational number added to an irrational number always yields an irrational result. The other options simplify to rational values such as 7, $1/3$, and $7/9$.
18. B — between 70 and 88. The box spans from $Q1 = 70$ to $Q3 = 88$, which contains the middle 50% of the data by definition. The interquartile range marks the central half between the first and third quartiles. The whiskers extending to 55 and 95 represent the outer portions of the data.
19. D — $2x + y = 5$ and $4x + 2y = 10$. Multiplying the first equation by 2 produces exactly the second, so the two equations represent the same line. Identical lines overlap at every point, giving infinitely many solutions. Equivalent equations after scaling are the hallmark of a dependent system.
20. C — average rate of change = 3. Using the labeled points, $(11 - 2)/(4 - 1) = 9/3 = 3$. The average rate of change is the slope of the line connecting the endpoints of the interval. It measures the mean change in output per unit input over that span.
21. A — $c = 36$. For $x^2 + bx + c$ to be a perfect square, c must equal $(b/2)^2$, and $(12/2)^2 = 36$. This makes the expression $(x + 6)^2$. Squaring half the linear coefficient completes the square.
22. C — $g(x)$ will eventually exceed and remain greater than $f(x)$. Exponential functions grow by repeated multiplication and ultimately outpace any linear function. Although $f(x) = 2x + 10$ leads for small x , $g(x) = 2^x$ overtakes it and stays larger for all greater inputs. Exponential growth always dominates linear growth in the long run.
23. B — Class X has a smaller standard deviation. Both classes have the same mean of 80, but Class X's scores cluster tightly near 80 while Class Y's spread widely from 60 to 100. Standard deviation measures spread about the mean, so the more concentrated set has the smaller value. Equal means with unequal spread isolate variability as the distinguishing feature.
24. D — 3 real zeros. The curve crosses the x -axis at three distinct points, $(-3, 0)$, $(0, 0)$, and $(3, 0)$. Each x -intercept corresponds to a real zero of the function. The number of crossings directly gives the count of real zeros.
25. $x = 2$, $y = 4$. Substitute $y = 3x - 2$ into $2x + y = 8$: $2x + (3x - 2) = 8$, so $5x = 10$ and $x = 2$; then $y = 3(2) - 2 = 4$. Verification: $2(2) + 4 = 8$ and $3(2) - 2 = 4$, so both equations hold. The solution is $(2, 4)$.
26. $y = (3/4)x - 9$. A parallel line shares the slope $3/4$. Using point-slope with $(8, -3)$: $y + 3 = (3/4)(x - 8)$, which expands to $y = (3/4)x - 6 - 3 = (3/4)x - 9$.
27. $x = 1/2$ and $x = -3$. Factoring gives $(2x - 1)(x + 3) = 0$. Setting each factor to zero, $2x - 1 = 0$ yields $x = 1/2$, and $x + 3 = 0$ yields $x = -3$.
28. Exponential. The ratios $1100/1000$, $1210/1100$, and $1331/1210$ all equal 1.1, a constant multiplier rather than a constant difference. The model is $V(t) = 1000(1.1)^t$, with initial value 1000 and a 10% annual growth rate.
29. $5(x - 3)(x + 3)$. Factor out the GCF of 5 to get $5(x^2 - 9)$, then apply the difference of two squares: $x^2 - 9 = (x - 3)(x + 3)$. The fully factored form is $5(x - 3)(x + 3)$.
30. $r = 3$ and $a_n = 4(3)^{(n - 1)}$. Since $a_4 = ar^3$, we have $4r^3 = 108$, so $r^3 = 27$ and $r = 3$. The explicit formula is $a_n = 4(3)^{(n - 1)}$.

31. Solution region is the overlap of $y \geq 2x - 4$ (solid line, shaded above) and $y < -x + 5$ (dashed line, shaded below). One valid point is $(0, 0)$: $0 \geq 2(0) - 4 = -4$ is true, and $0 < -(0) + 5 = 5$ is true. Therefore $(0, 0)$ lies in the solution set.
32. Residual = -4 , below the line. The predicted value is $\hat{y} = -3(6) + 50 = 32$, and the residual is $28 - 32 = -4$. Because the residual is negative, the observed value lies below the line of best fit.
33. a. The axis of symmetry is $x = -b/(2a) = -2/2 = -1$, and $f(-1) = 1 - 2 - 8 = -9$, giving vertex $(-1, -9)$. b. Factoring $x^2 + 2x - 8 = (x + 4)(x - 2) = 0$ gives zeros $x = -4$ and $x = 2$. c. The parabola opens upward ($a > 0$); the vertex is $(-1, -9)$; the axis of symmetry is $x = -1$; the x-intercepts are $(-4, 0)$ and $(2, 0)$; the y-intercept is $(0, -8)$; the minimum value is -9 .
34. a. The per-mile rate is $(29 - 14)/(9 - 4) = 15/5 = 3$ dollars per mile. b. $C(m) = 3m + 2$. c. Using $14 = 3(4) + b$ gives $b = 2$, so the flat fee is \$2, the base charge applied before any miles are driven. d. $C(15) = 3(15) + 2 = 47$, so a 15-mile ride costs \$47.
35. a. $h(0) = 80$ feet; this is the launch height of the platform. b. The axis of symmetry is $t = -64/(2 \cdot -16) = 2$ seconds, and $h(2) = -16(4) + 64(2) + 80 = 144$ feet, the maximum height. c. Setting $-16t^2 + 64t + 80 = 0$ and dividing by -16 gives $t^2 - 4t - 5 = 0$, which factors as $(t - 5)(t + 1) = 0$; the rocket hits the ground at $t = 5$ seconds. d. $h(0) = 80$, $h(1) = 128$, $h(2) = 144$, $h(3) = 128$, $h(4) = 80$, $h(5) = 0$. e. The rocket rises over $0 \leq t < 2$ and falls over $2 < t \leq 5$, since the vertex at $t = 2$ marks the maximum where the height stops increasing and begins decreasing.