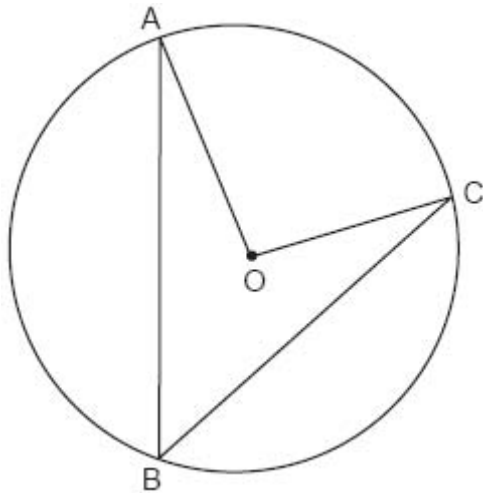1. 060801b, P.I. A.A.15

   For which value of x is $\dfrac{1}{27-3^x}$ undefined?

   [A] 0   [B] 1   [C] -3   [D] 3

2. 060802b, G.G.51

   In the accompanying diagram of circle O, $\overline{AB}$ and $\overline{BC}$ are chords and $m\angle AOC = 96$. What is $m\angle ABC$?


   [A] 32   [B] 48   [C] 96   [D] 192

3. 060803b, P.I. A.A.9

   Kathy deposits $25 into an investment account with an annual rate of 5%, compounded annually. The amount in her account can be determined by the formula $A = P(1+R)^t$, where P is the amount deposited, R is the annual interest rate, and t is the number of years the money is invested. If she makes no other deposits or withdrawals, how much money will be in her account at the end of 15 years?

   [A] $393.97   [B] $43.75

   [C] $51.97   [D] $25.75

4. 060804b, P.I. A2.A.51

   The accompanying graph shows the elevation of a certain region in New York State as a hiker travels along a trail.
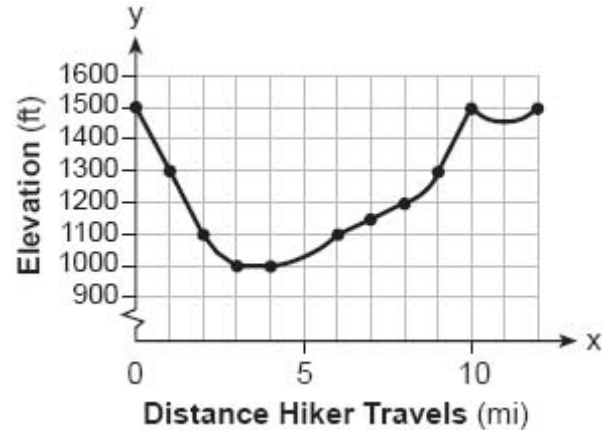
   What is the domain of this function?

   [A] $1{,}000 \le y \le 1{,}500$ [B] $0 \le y \le 12$

   [C] $0 \le x \le 12$ [D] $1{,}000 \le x \le 1{,}500$

5. 060805b, P.I. A2.A.38

   Which relation is a function?

   [A] $x^2 + y^2 = 16$ [B] $y^2 = x^2 + 3x - 4$

   [C] $2x^2 + 6y^2 = 1$ [D] $y = x^2 + 3x - 4$

6. 060806b, P.I. A2.A.42

   If $f(x) = x^2 + 4$ and $g(x) = \sqrt{1-x}$, what is the value of f(g(-3))?

   [A] 2   [B] $2i\sqrt{3}$ [C] 13   [D] 8

7. 060807b, P.I. A2.A.34

   Which expression represents the sum of the sequence 3, 5, 7, 9, 11?

   [A] $\displaystyle\sum_{n=1}^{5}(2n+1)$ [B] $\displaystyle\sum_{n=0}^{5}(2n+1)$

   [C] $\displaystyle\sum_{n=1}^{5}3n$ [D] $\displaystyle\sum_{n=1}^{5}(3n+1)$

8. 060808b, P.I. A2.A.1
    Which value of a does *not* satisfy the
    inequality $|a| > 2a - 3$?

    [A] -5   [B] 0   [C] 3   [D] -1

9. 060809b, P.I. G.G.54
    If point (5, 2) is rotated counterclockwise 90°
    about the origin, its image will be point

    [A] (2, -5)   [B] (-5, -2)

    [C] (-2, 5)   [D] (2, 5)

10. 060810b, P.I. A2.N.8
    What is the sum of $5 - 3i$ and the conjugate of
    $3 + 2i$?

    [A] 2 - 5i   [B] 8 - 5i

    [C] 2 + 5i   [D] 8 + 5i

11. 060811b, P.I. G.G.52
    In the accompanying diagram of circle O,
 $\overset{\frown}{AB} \cong \overset{\frown}{CD}$.
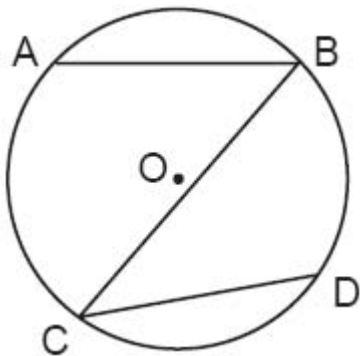
    Which statement is true?

    [A] $\angle ABC \cong \angle BCD$ [B] $\overline{AB} \parallel \overline{CD}$

    [C] $\overline{AB} \cong \overline{CD}$ [D] $\overset{\frown}{AC} \cong \overset{\frown}{BD}$


12. 060812b
    The expression $\cos^2 4\theta + \sin^2 4\theta$ is
    equivalent to

    [A] $\cos \theta$ [B] $\cos 8\theta$ [C] 2   [D] 1

13. 060813b
    The value of $\sqrt{x^2 - 9}$ is a real and irrational
    number when x is equal to

    [A] 5   [B] 4   [C] -3   [D] 0

14. 060814b, P.I. A2.A.27
    If $2^{4x+1} = 8^{x+a}$, which expression is equivalent
    to x?

    [A] $\dfrac{a-1}{3}$ [B] $3a - 1$

    [C] $\dfrac{a-1}{15}$ [D] $a - 1$

15. 060815b, P.I. A.N.4
    In 1995, the federal government paid off one-
    third of its debt. If the original amount of the
    debt was $4,920,000,000,000, which
    expression represents the amount that was not
    paid off?

    [A] 3.28×10^8 [B] 1.64×10^4

    [C] 3.28×10^{12} [D] 1.64×10^{12}

16. 060816b, P.I. A2.A.16
    The expression $\dfrac{2}{\sin x} - \dfrac{5}{\sin x - 1}$ is equivalent
    to

    [A] $\dfrac{-3 \sin x - 2}{\sin x (\sin x - 1)}$ [B] $\dfrac{-3}{\sin x (\sin x - 1)}$

    [C] $\dfrac{-3 \sin x - 2}{\sin x - 1}$ [D] $\dfrac{-3}{\sin x - 1}$

17. 060817b, P.I. A2.A.73

Al is standing 50 yards from a maple tree and 30 yards from an oak tree in the park. His position is shown in the accompanying diagram. If he is looking at the maple tree, he needs to turn his head 120° to look at the oak tree.

Maple tree

50 yd

Al's location | 120°

30 yd
Oak tree
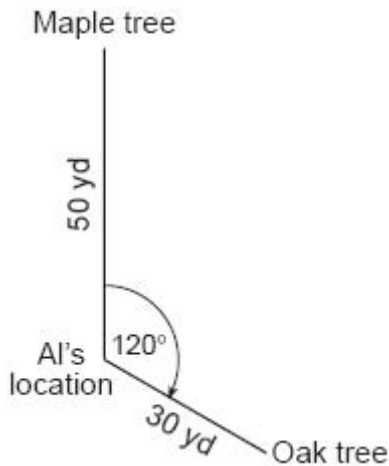
How many yards apart are the two trees?

[A] 65.2   [B] 58.3   [C] 70   [D] 75

18. 060818b, P.I. A2.A.61

A sprinkler system is set up to water the sector shown in the accompanying diagram, with angle *ABC* measuring 1 radian and radius *AB*=20 feet.

A

20 ft

B

C
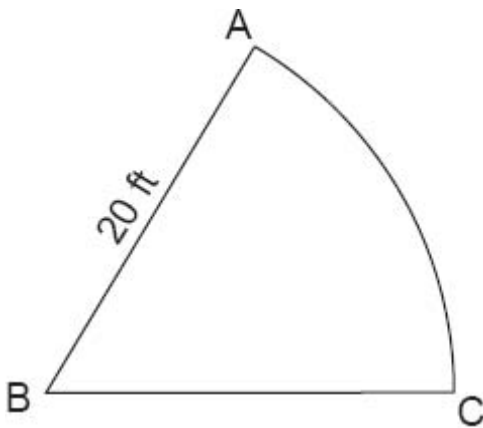
What is the length of arc *AC*, in feet?

[A] 20   [B] 10   [C] 63   [D] 31

19. 060819b, P.I. A2.N.9

The expression $i^{100} + i^{101} + i^{102}$ equals

[A] -1   [B] -i [C] 1   [D] i

20. 060820b, P.I. A2.A.20

Which equation has roots whose sum is 3 and whose product is -4?

[A] $x^2 + 4x - 3 = 0$ [B] $x^2 - 3x - 4 = 0$

[C] $x^2 - 4x + 3 = 0$ [D] $x^2 + 3x - 4 = 0$

21. 060821b

The entire graph of f(x) is symmetric with respect to the origin. If the accompanying graph represents f(x) for $x \ge 0$, sketch, on the same set of axes, the graph of f(x) for $x \le 0$.

y

x
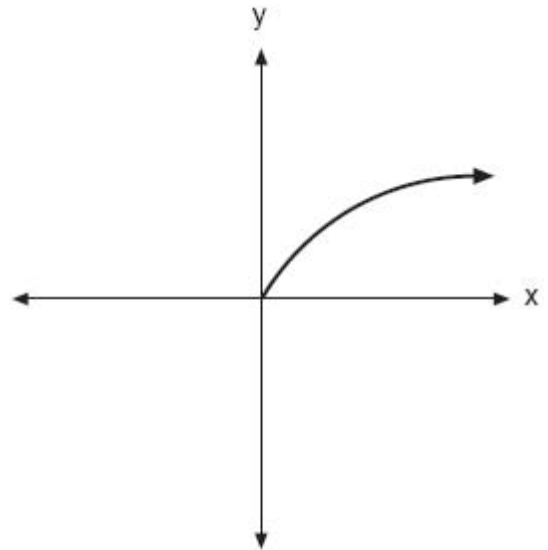
22. 060822b, P.I. A.A.8
    A laundry owner's estimate of her weekly
    profits, p, in dollars, is given by the equation
    $p = -4w^2 + 160w$, where w represents the
    number of workers she hires. What is the
    number of workers she should hire in order to
    earn the greatest profit? [The use of the
    accompanying grid is optional.]
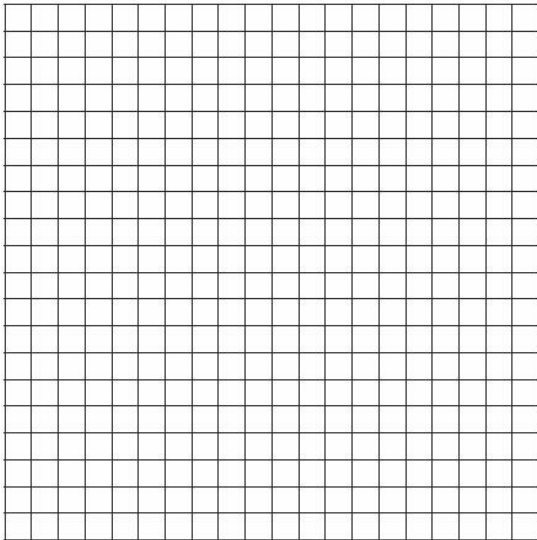
23. 060823b, P.I. A2.A.17
    Simplify: $\dfrac{\dfrac{x}{3} - \dfrac{3}{x}}{\dfrac{x-3}{x}}$

24. 060824b, P.I. G.G.27
    The coordinates of quadrilateral $PRAT$ are
    $P(a,b)$, $R(a,b+3)$, $A(a+3,b+4)$, and
    $T(a+6,b+2)$. Prove that $\overline{RA}$ is parallel to
    $\overline{PT}$.

25. 060825b
    The accompanying diagram shows the peak
    of a roof that is in the shape of an isosceles
    triangle. A base angle of the triangle is 50°
    and each side of the roof is 20.4 feet.
    Determine, to the *nearest tenth of a square
    foot*, the area of this triangular region.
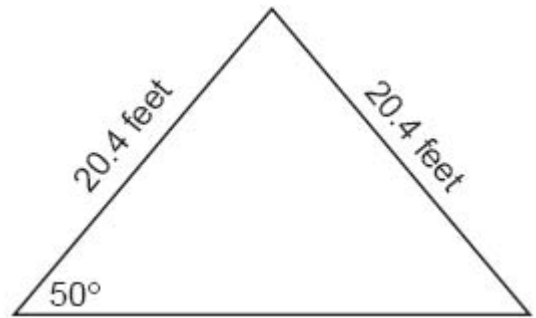
26. 060826b, P.I. A2.S.5
    The weights of the boxes of animal crackers
    coming off an assembly line differ slightly
    and form a normal distribution whose mean is
    9.8 ounces and whose standard deviation is
    0.6 ounce. Determine the number of boxes of
    animal crackers in a shipment of 5,000 boxes
    that are expected to weigh *more than* 11
    ounces.

27. 060827b, P.I. A2.S.7

The accompanying table shows the amount of water vapor, *y*, that will saturate 1 cubic meter of air at different temperatures, *x*.

Amount of Water Vapor That Will Saturate
1 Cubic Meter of Air at Different Temperatures

Air Temperature (x) (°C)	Water Vapor (y) (g)
−20	1
−10	2
0	5
10	9
20	17
30	29
40	50

Write an exponential regression equation for this set of data, rounding all values to the *nearest thousandth*. Using this equation, predict the amount of water vapor that will saturate 1 cubic meter of air at a temperature of 50°C, and round your answer to the *nearest tenth of a gram*.

28. 060828b, P.I. G.G.47

Four streets in a town are illustrated in the accompanying diagram. If the distance on Poplar Street from *F* to *P* is 12 miles and the distance on Maple Street from *E* to *M* is 10 miles, find the distance on Maple Street, in miles, from *M* to *P*.
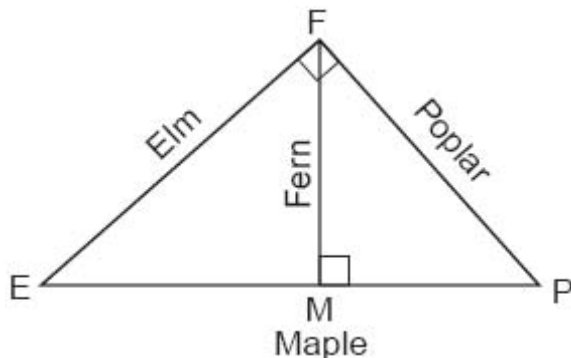
29. 060829b, P.I. A2.A.68

Find all values of θ in the interval $0° \le \theta < 360°$ that satisfy the equation $3\cos 2\theta + 2\sin\theta + 1 = 0$, and round all answers to the *nearest hundredth of a degree*. [Only an algebraic solution can receive full credit.]

30. 060830b, P.I. A2.S.15

The probability of rain on the last day of July is 90%. If the probability remains constant for the first seven days of August, what is the probability that it will rain *at least* six of those seven days in August?

31. 060831b, P.I. G.G.58

The engineering office in the village of Whitesboro has a map of the village that is laid out on a rectangular coordinate system. A traffic circle located on the map is represented by the equation $(x+4)^2 + (y-2)^2 = 81$. The village planning commission asks that the transformation D_2 be applied to produce a new traffic circle, where the center of dilation is at the origin. Find the coordinates of the center of the new traffic circle. Find the length of the radius of the new traffic circle.

32.　060832b

A radio wave has an amplitude of 3 and a wavelength (period) of π meters. On the accompanying grid, using the interval 0 to 2π, draw a possible sine curve for this wave that passes through the origin.
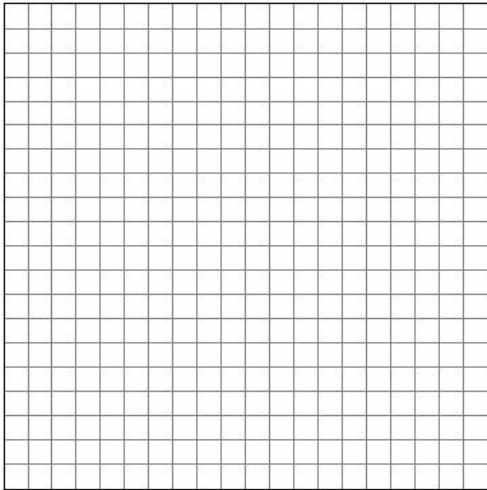
33.　060833b, P.I. A2.A.28

Solve for x:　$\log_3(x^2 - 4) - \log_3(x + 2) = 2$

34.　060834b, P.I. A2.A.73

Gerardo and Bennie are pushing a box. Gerardo pushes with a force of 50 pounds in an easterly direction, and Bennie pushes with a force of 39 pounds in a northeasterly direction. The resultant force forms an angle of 32° with the 39-pound force. Find the angle between the 50-pound force and the 39-pound force, to the *nearest tenth of a degree*. Find the magnitude of the resultant force, to the *nearest pound*.

[1] D

[2] B

[3] C

[4] C

[5] D

[6] D

[7] A

[8] C

[9] C

[10] B

[11] C

[12] D

[13] B

[14] B

[15] C

[16] A

[17] C

[18] A

[19] D

[20] B

[2] A correct graph of f(x) for $x<0$ is drawn.
[1] One conceptual error is made, such as reflecting f(x) over an axis.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[21] incorrect procedure.

[2] 20, and appropriate work is shown, such as finding the turning point or sketching the graph of the equation.
[1] Appropriate work is shown, but one computational or graphing error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] The graph of the equation is sketched correctly, but no further correct work is shown.
or [1] (20,1600) is identified as the turning point, but the number of workers is not stated.
or [1] 20, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[22] incorrect procedure.

[2] $\dfrac{x+3}{3}$, and appropriate work is shown.

[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.

or [1] $\dfrac{x+3}{3}$, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[23] incorrect procedure.

[2] The slopes of $\overline{RA}$ and $\overline{PT}$ are calculated correctly, and appropriate work is shown, and the statement is made that since their slopes are equal, the lines are parallel.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] Appropriate work is shown, and the slopes are shown to be equal, but no concluding statement is written.
[0] A statement is written that lines with equal slopes are parallel, but no work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an
[24] obviously incorrect procedure.

[2] 204.9, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or rounding error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 204.9, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[25] incorrect procedure.

[2] 115, and appropriate work is shown.
[1] Appropriate work is shown, but one computational error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] 115, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[26] incorrect procedure.

[4] $y = 4.194(1.068)^{x}$ and 112.5, and appropriate work is shown.
[3] Appropriate work is shown, but one computational or rounding error is made.
or [3] $y = 4.194(1.068)^{x}$ and 112.5, but no substitution is shown.
or [3] The expression $4.194(1.068)^{x}$ is written and 112.5, and appropriate substitution is shown.
[2] Appropriate work is shown, but two or more computational or rounding errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] $y = 4.194(1.068)^{x}$ but no further correct work is shown.
or [2] An incorrect regression equation of equal difficulty is solved appropriately.
[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [1] An incorrect regression equation of a lesser degree of difficulty is solved appropriately.
or [1] The expression $4.194(1.068)^{x}$ is written and 112.5, but no work is shown.
or [1] 112.5, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously
[27] incorrect procedure.

[4] 8, and appropriate work is shown, such as solving the proportion $\dfrac{10+x}{12} = \dfrac{12}{x}$.

[3] Appropriate work is shown, but one computational error is made.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] The proportion $\dfrac{10+x}{12} = \dfrac{12}{x}$ is written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or [1] 8, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[28] _____

[4] 90, 221.81, and 318.19, and appropriate work is shown, such as solving the equation $3\sin^2\theta - \sin\theta - 2 = 0.$

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] The equation is solved correctly for θ, but only one or two of the solutions are found.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made.

or [2] 90, 221.81, and 3.18.19, and appropriate work is shown, but a graphic method is used.

or [2] Appropriate work is shown to find the values of $\sin\theta$, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] A correct quadratic equation in standard form is written, but no further correct work is shown.

or [1] 90, 221.81, and 318.19, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[29] _____

[4] .8503056 or an equivalent answer, and appropriate work is shown, such as

$_7C_6(.9)^6(.1)^1 + _7C_7(.9)^7(.1)^0$.

[3] Appropriate work is shown, but one computational or rounding error is made.

or [3] The two individual probabilities are calculated correctly, but they are not added.

[2] Appropriate work is shown, but two or more computational or rounding errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as finding the probability of at most 6 days.

or [2] The expression

$_7C_6(.9)^6(.1)^1 + _7C_7(.9)^7(.1)^0$ is written, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.

or [1] Appropriate work is shown to find .3720087, the probability of exactly 6 days, but no further correct work is shown.

or [1] .8503056 or an equivalent answer, but no work is shown.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[30] incorrect procedure.

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[4] (-8, 4) and 18, and appropriate work is shown.

[3] Appropriate work is shown, but one computational error is made.

[2] Appropriate work is shown, but two or more computational errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as using an incorrect dilation.

or [2] The center and radius are found appropriately for an incorrect center and radius of the original equation.

or [2] (-8, 4), and appropriate work is shown, but no further correct work is shown.

[1] Appropriate work is shown, but one conceptual error and one computational error are made.

or [1] 18, and appropriate work is shown, but no further correct work is shown.

or [1] (-8, 4) and 18, but no work is shown.

[0] (-8, 4) or 18, but no work is shown.

or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a

[31] correct response that was obtained by an obviously incorrect procedure.

---

[4] The graph of $y = 3\sin 2x$ or the graph of $y = -3\sin 2x$ is drawn.

[3] Appropriate work is shown, but one graphing error is made, such as not drawing the graph over the entire interval.

[2] Appropriate work is shown, but two or more graphing errors are made.

or [2] Appropriate work is shown, but one conceptual error is made, such as graphing $y = \sin 2x$ or $y = 3\sin x$.

[1] Appropriate work is shown, but one conceptual error and one graphing error are made.

or [1] The equation $y = 3\sin 2x$ or $y = -3\sin 2x$ is written, but no graph is drawn.

[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously

[32] incorrect procedure.

[6] 11, and appropriate work is shown.
[5] Appropriate work is shown, but one computational error is made.
or [5] The given equation is solved correctly for x, but the extraneous root is not rejected.
[4] Appropriate work is shown, but two or more computational errors are made.
[3] Appropriate work is shown, but one conceptual error is made.
or [3] The equation $x^2 - 9x - 22 = 0$ is written, but no further correct work is shown.
[2] Appropriate work is shown, but one conceptual error and one computational error are made.
or [2] The equation $\dfrac{x^2 - 4}{x + 2} = 9$ is written, but no further correct work is shown.
[1] The equation $\log_3(x - 2) = 2$ is written, but no further correct work is, shown.
or [1] 11, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[33] _____

[6] 56.4 and 79, and appropriate work is shown, such as using the Law of Sines and then the Law of Cosines or the Law of Sines.
[5] Appropriate work is shown, but one computational or rounding error is made.
or [5] Appropriate work is shown, and the angle between the resultant and the 50-pound force is found to be 24.4 and the force is found to be 79, but the angle between the original forces is not stated.
[4] Appropriate work is shown, but two or more computational or rounding errors are made.
[3] Appropriate work is shown, but one conceptual error is made.
or [3] Appropriate work is shown to find 56.4, but no further correct work is shown.
[2] Appropriate work is shown, but one conceptual error and one computational or rounding error are made.
or [2] Appropriate work is shown to find 24.4, but no further correct work is shown.
or [2] 56.4 and 79, but no work is shown.
[1] A complete and correctly labeled diagram is drawn to illustrate the problem, but no further correct work is shown.
or [1] 56.4 or 79, but no work is shown.
[0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.

[34] _____