

1. 080801b, P.I. G.G.61

Which transformation of $y = 2^x$ results in the function $y = 2^x - 2$?

- [A] $T_{0,-1}$ [B] $r_{y\text{-axis}}$
[C] $r_{x\text{-axis}}$ [D] $T_{0,-2}$

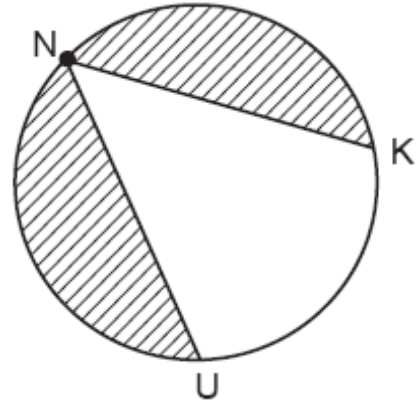
2. 080802b

Tanner and Robbie discovered that the means of their grades for the first semester in Mrs. Merrell's mathematics class are identical. They also noticed that the standard deviation of Tanner's scores is 20.7, while the standard deviation of Robbie's scores is 2.7. Which statement must be true?

- [A] Robbie had more failing grades during the semester than Tanner had.
[B] The median for Robbie's grades is lower than the median for Tanner's grades.
[C] In general, Robbie's grades are lower than Tanner's grades.
[D] Robbie's grades are more consistent than Tanner's grades.

3. 080803b, P.I. G.G.53

The NUK Energy Company is designing a new logo, as shown in the accompanying diagram, with $m\widehat{NK} = 130$ and $m\widehat{NK} = m\widehat{NU}$.



What is the measure of $\angle KNU$?

- [A] 100° [B] 65° [C] 50° [D] 80°

4. 080804b

What is the graph of the function

$$y = \sqrt{4 - x^2} ?$$

- [A] a circle whose radius is 4 and whose center is at the origin
[B] the upper half of a circle whose radius is 2 and whose center is at the origin
[C] a circle whose radius is 2 and whose center is at the origin
[D] the upper half of a circle whose radius is 4 and whose center is at the origin

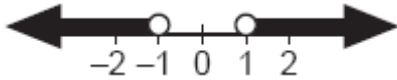
5. 080805b, P.I. A2.A.16

The expression $\frac{6}{y-5} - \frac{y+5}{y^2-25}$ is equivalent to

- [A] $\frac{5}{y+5}$ [B] $\frac{5y}{y-5}$
[C] $\frac{5}{y-5}$ [D] $\frac{5y}{y+5}$

6. 080806b, P.I. A2.A.1

Which inequality is represented by the accompanying graph?



- [A] $|x| < 1$ [B] $|x| \geq 1$
 [C] $|x| > 1$ [D] $|x| \leq 1$

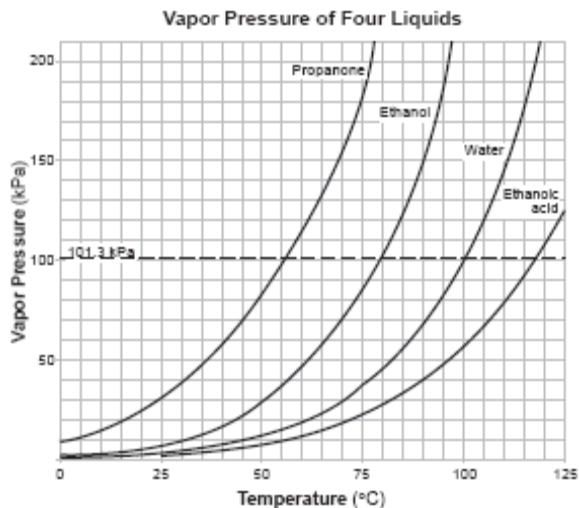
7. 080807b, P.I. A2.A.10

If $n > 0$, the expression $(\frac{1}{n})^{-\frac{2}{3}}$ is equal to

- [A] $\sqrt{n^3}$ [B] $-n^{\frac{2}{3}}$
 [C] $-n^{\frac{3}{2}}$ [D] $\sqrt[3]{n^2}$

8. 080808b

The family of curves shown in the accompanying graph illustrates the transformations of a function.



Which type of function could be the original function?

- [A] exponential [B] tangent
 [C] sinusoidal [D] linear

9. 080809b, P.I. A2.A.19

The expression $\frac{1}{2}\log m - 3\log n$ is equivalent to

- [A] $\log \frac{1}{2}m - 3\log n$ [B] $\log \frac{m^2}{3\sqrt{n}}$
 [C] $\log \sqrt{m} + \log n^3$ [D] $\log \frac{\sqrt{m}}{n^3}$

10. 080810b, P.I. G.G.59

Under the transformation $(x, y) \rightarrow (2x, 2y)$, which property is *not* preserved?

- [A] angle measure [B] parallelism
 [C] orientation [D] distance

11. 080811b

If $10^k = x$, then 10^{3k} is equal to

- [A] $1,000x$ [B] $3x$ [C] x^3 [D] $3+x$

12. 080812b, P.I. A2.A.38

Which equation is *not* a function?

- [A] $y = \sec x$ [B] $y = 3x^2 - 4$
 [C] $y = \sin x$ [D] $x^2 = 16 - y^2$

13. 080813b, P.I. A2.A.67

The expression $1 - \sec x$ is equivalent to

- [A] $\frac{\sin x - 1}{\sin x}$ [B] $-\tan x$
 [C] $\frac{\cos x - 1}{\cos x}$ [D] $\frac{\tan x}{\sec x - 1}$

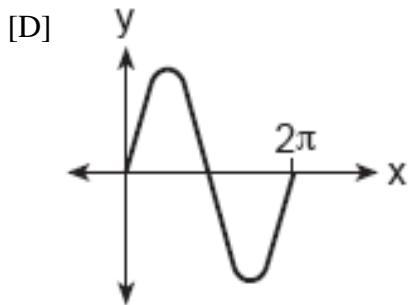
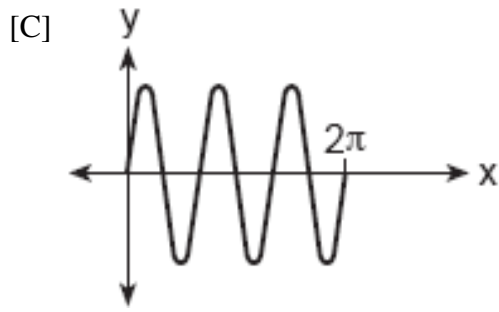
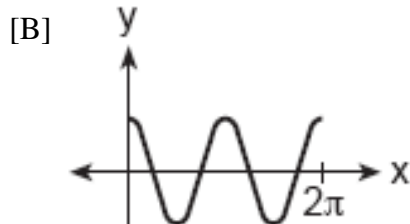
14. 080814b, P.I. A2.A.2

The roots of the equation $5x^2 - 2x + 1 = 0$ are

- [A] real, rational, and equal
 [B] imaginary
 [C] real, rational, and unequal
 [D] real, irrational, and unequal

15. 080815b, P.I. A2.A.72

Which graph represents a sound wave that follows a curve whose period is π and that is in the form $y = a \sin bx$?



16. 080816b, P.I. A2.N.9

The expression $\frac{\sqrt{-50}}{\sqrt{2}}$ is equivalent to

- [A] $5i$ [B] -5 [C] 5 [D] $-5i$

17. 080817b, P.I. A2.A.66

What is the value of $\csc(\text{Arc sin } \frac{3}{4})$?

- [A] $\frac{\sqrt{7}}{4}$ [B] $\frac{4}{\sqrt{7}}$ [C] $\frac{4}{3}$ [D] $\frac{3}{4}$

18. 080818b, P.I. A2.A.23

One root of the equation $\frac{3x}{2} + \frac{1}{x} = -\frac{3x}{4}$ is

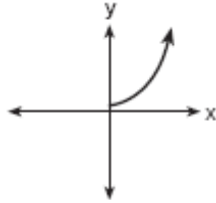
- [A] $\frac{4}{9}$ [B] $\frac{2i}{3}$ [C] $\frac{2}{3}$ [D] $\frac{4i}{9}$

19. 080819b, P.I. A2.A.27

If $2^{(16x^2-8x-3)} = 1$, what does x equal?

- [A] $-\frac{1}{4}$ and $\frac{3}{4}$ [B] $\frac{1}{4}$, only
[C] $\frac{3}{4}$, only [D] $\frac{1}{4}$ and $-\frac{3}{4}$

20. 080820b, P.I. A2.A.46
The accompanying graph shows the relationship between kinetic energy, y , and velocity, x .



The reflection of this graph in the line $y = x$ is

- [A] [B] [C] [D]

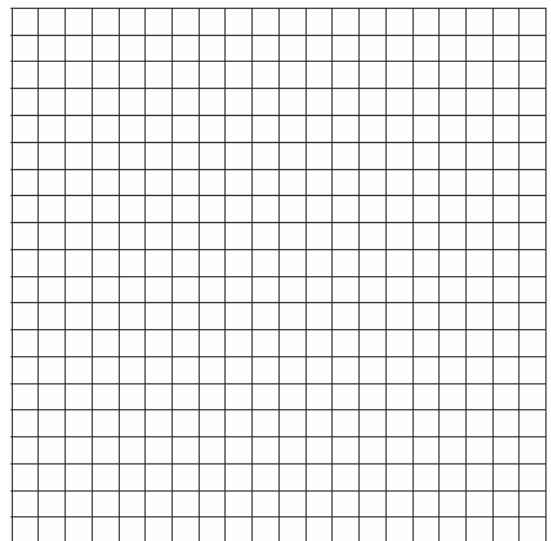
21. 080821b, P.I. A2.A.22
The number of dogs, D , housed at a county animal shelter is modeled by the function $D = 4\sqrt{2M} + 50$, where M is the number of months the shelter has been open. How many months will it take for 74 dogs to be housed at the shelter?

22. 080822b, A2.A.1
Solve for all values of x : $|3x - 2| = 6$

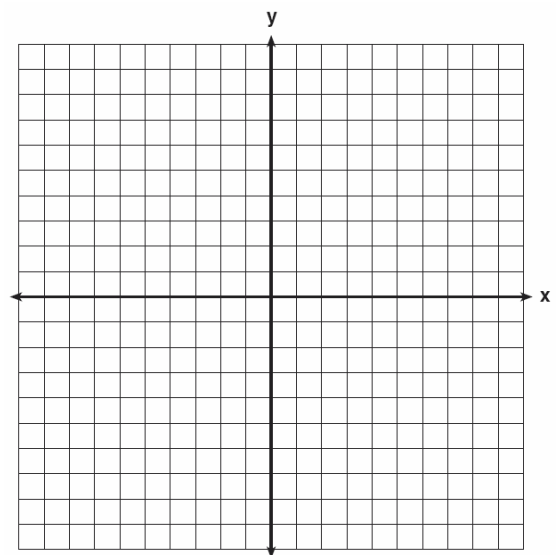
23. 080823b, P.I. A2.N.10
Evaluate: $3 \sum_{x=2}^4 (x^2 - 5)$

24. 080824b, P.I. A2.A.17
Express in simplest form: $\frac{1 - \frac{1}{x}}{x - 2 + \frac{1}{x}}$

25. 080825b, P.I. A.A.8
Each year, the student council at Briarwood High School sponsors a community talent show to raise money. In previous years, the council has discovered that profit from ticket sales, $P(x)$, is a function of the amount charged per ticket, x , in dollars, as modeled by the equation $P(x) = 120x - 12x^2$. What amount should the council charge for a ticket to make the greatest profit? [The use of the grid is optional.]



26. 080826b, P.I. A2.A.44
On the accompanying set of axes, graph the function $f(x) = 2x + 4$ and its inverse, $f^{-1}(x)$.



27. 080827b, P.I. A2.S.7

The accompanying table shows the number of bacteria present in a certain culture over a 5-hour period, where x is the time, in hours, and y is the number of bacteria.

x	y
0	1,000
1	1,049
2	1,100
3	1,157
4	1,212
5	1,271

Write an exponential regression equation for this set of data, rounding all values to *four decimal places*. Using this equation, determine the number of whole bacteria present when x equals 6.5 hours.

28. 080828b, P.I. A2.A.73

During a training exercise in the Mojave Desert, two military vehicles left the base camp at the same time, one traveling at an average speed of 25 miles per hour and the other at an average speed of 50 miles per hour. Each vehicle traveled along a level, straight route. If the exercise requires the two vehicles to be 65 miles apart after traveling for 1 hour, what must the angle between the two routes be, to the *nearest degree*?

29. 080829b, P.I. G.G.48

A parcel of land is in the shape of an isosceles triangle. The base has a length of 673 feet and the two equal legs meet at an angle of 43° . Find, to the *nearest square foot*, the area of the parcel of land.

30. 080830b, P.I. A2.S.15

East West Airlines has a good reputation for being on time. The probability that one of its flights will be on time is .91. If Mrs. Williams flies East West for her next five flights, what is the probability that *at least* three of them will be on time? Round your answer to the *nearest thousandth*.

31. 080831b

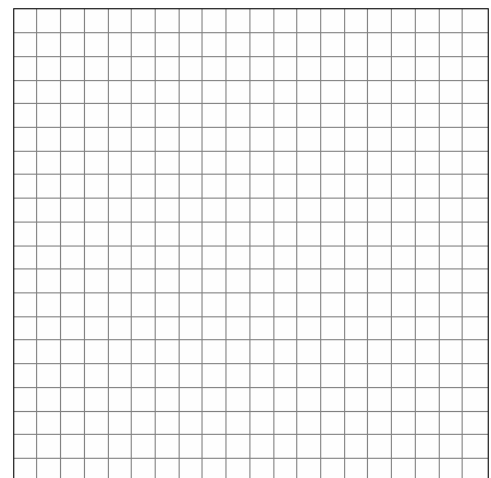
A landscape architect's designs for a town park call for two parabolic-shaped walkways. When the park is mapped on a Cartesian coordinate plane, the pathways intersect at two points. If the equations of the curves of the walkways are $y = 11x^2 + 23x + 210$ and $y = -19x^2 - 7x + 390$, determine the coordinates of the two points of intersection. [Only an algebraic solution can receive full credit.]

32. 080832b, P.I. A2.A.27

Kristen invests \$5,000 in a bank. The bank pays 6% interest compounded monthly. To the *nearest tenth of a year*, how long must she leave the money in the bank for it to double?

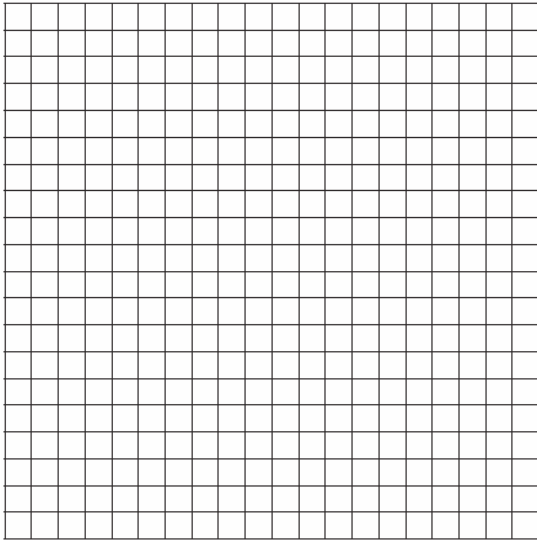
(Use the formula $A = P(1 + \frac{r}{n})^n$, where A is

the amount accrued, P is the principal, r is the interest rate, $n = 12$, and t is the length of time, in years.) [The use of the grid is optional.]



33. 080833b, P.I. A2.A.68

Find all values of x in the interval $0^\circ \leq x < 360^\circ$ that satisfy the equation $3\cos 2x = \cos x + 2$. Express your answers to the nearest degree. [The use of the grid is optional.]



34. 080834b, P.I. G.G.27

A tricolored flag is made out of a rectangular piece of cloth whose corners are labeled A , B , C , and D . The colored regions are separated by two line segments, \overline{BM} and \overline{CM} , that meet at point M , the midpoint of side \overline{AD} . Prove that the two line segments that separate the regions will always be equal in length, regardless of the size of the flag.

- [1] D
- [2] D
- [3] C
- [4] B
- [5] C
- [6] C
- [7] D
- [8] A
- [9] D
- [10] D
- [11] C
- [12] D
- [13] C
- [14] B
- [15] A
- [16] A
- [17] C
- [18] B
- [19] A
- [20] C

[2] 18, and appropriate work is shown, such as an algebraic or a graphic solution or trial and error with at least three trials and appropriate checks.

[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 trial-and-error method is used and at least six systematic trials and appropriate checks are shown, but no solution is found.

[1] 18, but no work or fewer than three trials with appropriate checks are shown.

[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] $\frac{8}{3}$ and $-\frac{4}{3}$, 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] $3x - 2 = 6$ and $3x - 2 = -6$, but no further correct work is shown.

or [1] $\frac{8}{3}$ or $-\frac{4}{3}$, and appropriate work is shown.

or [1] $\frac{8}{3}$ and $-\frac{4}{3}$, but no work is shown.

[0] $\frac{8}{3}$ or $-\frac{4}{3}$, 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

[22] incorrect procedure.

- [2] 42, 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] 42, 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.
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- [23] $\frac{1}{x-1}$, and appropriate work is shown.
[1] Appropriate work is shown, but one computational or factoring error is made.
or [1] Appropriate work is shown, but one conceptual error is made.
or [1] $\frac{1}{x-1}$, 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.
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- [24] [2] 5, and appropriate work is shown.
[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] 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 incorrect procedure.
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- [25] [2] Both $f(x)$ and $f^{-1}(x)$ are graphed correctly and at least one is labeled.
[1] Appropriate work is shown, but one graphing error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as graphing the inverse as a reflection over an axis.
or [1] $f(x)$ is graphed incorrectly, but an appropriate graph is drawn for $f^{-1}(x)$.
or [1] A correct equation for $f^{-1}(x)$ is written, but no graphs are drawn.
[0] $f(x)$ is graphed correctly, but no further correct work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [26] [2] Both $f(x)$ and $f^{-1}(x)$ are graphed correctly and at least one is labeled.
[1] Appropriate work is shown, but one graphing error is made.
or [1] Appropriate work is shown, but one conceptual error is made, such as graphing the inverse as a reflection over an axis.
or [1] $f(x)$ is graphed incorrectly, but an appropriate graph is drawn for $f^{-1}(x)$.
or [1] A correct equation for $f^{-1}(x)$ is written, but no graphs are drawn.
[0] $f(x)$ is graphed correctly, but no further correct work is shown.
or [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
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- [4] $y = 999.9725(1.0493)^x$ and 1,367, and appropriate work is shown.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- or [3] $y = 999.9725(1.0493)^x$ and 1,367, but no substitution is shown.
- or [3] The expression $999.9725(1.0493)^x$ is written and 1,367, and an 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] An incorrect equation of equal difficulty is solved appropriately.
- or [2] $y = 999.9725(1.0493)^x$, 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] The expression $999.9725(1.0493)^x$ is written, but no further correct work is shown.
- or [1] An incorrect equation of a lesser degree of difficulty is solved appropriately.
- or [1] 1,367, 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.
- [27] incorrect procedure.

- [4] 116, and appropriate work is shown, such as the use of the Law of Cosines.
- [3] Appropriate work is shown, but one computational or rounding error is made.
- [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] Correct substitution is made into the Law of Cosines, 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 complete and correctly labeled diagram is drawn, but no further correct work is shown.
- or [1] 116, 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] incorrect procedure.

[4] 287,457, and appropriate work is shown, such as using trigonometry and the area formula or the Law of Sines and the area formula.

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

[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 using an incorrect trigonometric function.

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

or [1] The length of the altitude or the length of a leg is found correctly, but no further correct work is shown.

or [1] Correct, substitutions are made into the Law of Sines, but no further correct work is shown.

or [1] 287,457, 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

[29] incorrect procedure.

[4] .994, and appropriate work is shown.

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

or [3] The 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 that at most three flights will be on time.

[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 exactly three flights will be on time.

or [1] .994, 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.

- [4] (2,300) and (-3,240), and appropriate algebraic work is shown.
- [3] Appropriate work is shown, but one computational or factoring error is made.
or [3] The x -values of 2 and -3 are found correctly, but only one y -value is found, correctly.
- [2] Appropriate work is shown, but two or more computational or factoring errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The x -values of 2 and -3 are found correctly, but no further correct work is shown.
or [2] (2,300) or (-3,240), and appropriate algebraic work is shown.
or [2] (2,300) and (-3,240), but a method other than an algebraic solution is used.
- [1] Appropriate work is shown, but one conceptual error and one computational or factoring error are made.
or [1] A method other than an algebraic solution is used, and one error is made.
or [1] (2,300) and (-3,240), but no work is shown.
- [0] (2,300) or (-3,240), 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 obviously incorrect procedure.
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- [31]

- [4] 11.6, and appropriate work is shown, such as the use of logarithms, graphing, or trial and error with at least three trials and appropriate checks.
- [3] Appropriate work is shown, but one computational, rounding, or graphing error is made.
- [2] Appropriate work is shown, but two or more computational, rounding, or graphing errors are made.
or [2] Appropriate work is shown, but one conceptual error is made.
or [2] The trial-and-error method is used to find the correct solution, but only two trials and appropriate checks are shown.
or [2] The trial-and-error method is attempted, and at least six systematic trials and appropriate checks are shown, but no solution is found.
or [2] A correct logarithmic equation is written, but no further correct work is shown.
- [1] Appropriate work is shown, but one conceptual error and one computational, rounding, or graphing error are made.
or [1] A correct substitution is made into the compound interest formula, but no further correct work is shown.
or [1] A correct graph is drawn, but no further correct work is shown.
or [1] 11.6, but no work or only one trial with an appropriate check 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.
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- [32]

- [6] 0, 146, and 214, and appropriate work is shown.
- [5] Appropriate work is shown, but one computational, rounding, factoring, or graphing error is made.
- or [5] Appropriate work is shown, and the equation is solved for 0 and 146, but 214 is not found.
- or [5] Appropriate work is shown to find the correct solutions, but 360 is included.
- [4] Appropriate work is shown, but two or more computational, rounding, factoring, or graphing errors are made.
- or [4] Appropriate work is shown, but the equation is solved for 0, 146, and 360.
- [3] Appropriate work is shown, but one conceptual error is made.
- or [3] Appropriate work is shown, and the equation is factored correctly, but no further correct work is shown.
- [2] Appropriate work is shown, but one conceptual error and one computational, rounding, factoring, or graphing error are made.
- or [2] $6\cos^2 x - \cos x - 5 = 0$ is written, but no further correct work is shown.
- [1] $2\cos^2 x - 1$ is substituted for $\cos 2x$, but no further correct work is shown.
- or [1] 0, 146, and 214, but no work is shown.
- [0] 0 or 146 or 214, 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 obviously incorrect procedure.
- [33] _____

- [6] A complete and correct proof is written.
- [5] $\triangle BAM \cong \triangle CDM$ is proven, but no further correct work is shown.
- or [5] A proof is written that demonstrates a thorough understanding of the method of proof and contains no conceptual errors, but one statement and/or reason is missing or is incorrect.
- [4] A proof is written that demonstrates a good understanding of the method of proof and contains no conceptual errors, but two statements and/or reasons are missing or are incorrect.
- 3] A proof is written that demonstrates a good understanding of the method of proof, but one conceptual error is made.
- [2] Some correct relevant statements about the proof are made, but three or four statements and/or reasons are missing or are incorrect.
- [1] Only one correct statement and reason are written.
- [0] The "given" and/or the "prove" statements are rewritten in the style of a formal proof, but no further correct relevant statements are written.
- [0] A zero response is completely incorrect, irrelevant, or incoherent or is a correct response that was obtained by an obviously incorrect procedure.
- [34] _____