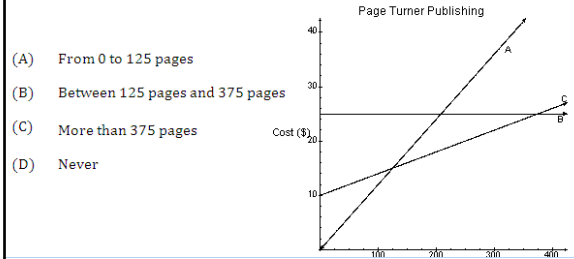


MidTerm Review January 2012

The graph represents three different options for publishing a book. For what number of pages is Plan C the lowest cost option?



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2. The chart represents two salary options.

	Base Salary (\$)	Rate Per Hour (\$)
Option A	40	20
Option B	50	15

At what time, in hours, will both options have the same salary?

- (A) 0.5 (B) 2 (C) 3.5 (D) 18

Which system of equations has the solution $(-1, 3)$?

- (A) $x + y = 2$
 $x - y = -4$
- (B) $2x + 2y = 4$
 $3x - 6y = -24$
- (C) $x - y = -7$
 $x + 3y = 10$
- (D) $2x - y = 5$
 $2x + y = -5$

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What is the solution for this system of equations?

$$\begin{aligned}x + y &= 6 \\ 3x + 2y &= 17\end{aligned}$$

- (A) $(-29, 35)$ (B) $(1, 7)$ (C) $(5, 1)$ (D) $(29, -23)$

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Which procedure would help solve this system of equations using elimination?

$$A: 3x + 2y = 3$$

$$B: 5x - 4y = -17$$

- (A) Multiply equation A by -2 then add to equation B
 (B) Multiply equation A by 2 then add to equation B
 (C) Multiply equation B by -2 then add to equation A
 (D) Multiply equation B by 2 then add to equation A

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In a local supermarket, the cost of 1 apple (a), 1 banana (b) and 1 coconut (c) is \$5.89. The cost of 3 bananas and 2 coconuts is \$10.53. The cost of 12 apples and 6 bananas is \$17.70. Which system of equation represents this situation?

- (A) $a + b + c = 5.89$
 $3a + 2c = 10.53$
 $12a + 6b = 17.70$
- (B) $a + b + c = 5.89$
 $3a + 2b = 10.53$
 $12a + 6b = 17.70$
- (C) $a + b + c = 5.89$
 $3b + 2c = 10.53$
 $12a + 6c = 17.70$
- (D) $a + b + c = 5.89$
 $3b + 2c = 10.53$
 $12a + 6b = 17.70$

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What is the solution for this system of equations?

$$\begin{aligned}x &= 2 \\ x + y &= 5 \\ x + y + z &= 4\end{aligned}$$

- (A) $(2, -3, 5)$ (B) $(2, 3, -1)$ (C) $(2, 3, 1)$ (D) $(2, 7, -5)$

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8. Which matrix has an inverse?

(A) $\begin{bmatrix} -8 & 4 \\ 6 & -3 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & -3 \\ 2 & -3 \end{bmatrix}$ (C) $\begin{bmatrix} 5 & 2 \\ 3 & 1 \end{bmatrix}$ (D) $\begin{bmatrix} 6 \\ 12 \end{bmatrix}$

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9. What is the matrix representation for this system of equations?

$$\begin{aligned} x + 2y + 5z &= 8 \\ 3x - 5y &= -2 \\ 2y + 3z &= 5 \end{aligned}$$

(A) $\begin{bmatrix} 1 & 2 & 5 \\ 3 & -5 & 0 \\ 0 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ -2 \\ 5 \end{bmatrix}$ (B) $\begin{bmatrix} 1 & 2 & 5 \\ 3 & -5 & 0 \\ 2 & 3 & 0 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ -2 \\ 5 \end{bmatrix}$

(C) $\begin{bmatrix} 1 & 2 & 5 \\ 3 & -5 & 2 \\ 2 & 3 & -5 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ 0 \\ 0 \end{bmatrix}$ (D) $\begin{bmatrix} 1 & 2 & 5 \\ 3 & -5 & 2 \\ -5 & 2 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 8 \\ 0 \\ 0 \end{bmatrix}$

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Solve the system of equations.

$$\begin{bmatrix} 3 & -5 \\ 1 & -2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 11 \\ 4 \end{bmatrix}$$

(A) $\begin{bmatrix} -13 \\ -3 \end{bmatrix}$ (B) $\begin{bmatrix} -2 \\ 1 \end{bmatrix}$ (C) $\begin{bmatrix} 2 \\ -1 \end{bmatrix}$ (D) $\begin{bmatrix} 13 \\ 3 \end{bmatrix}$

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Which statement is true if $[A] = \begin{bmatrix} 2 & 3 \\ 3 & 5 \end{bmatrix}$, its inverse is $[A]^{-1} = \begin{bmatrix} 5 & -3 \\ -3 & 2 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$?

(A) $[A] \times [A]^{-1} = [I]$ (B) $[A] \times [I] = [A]^{-1}$

(C) $[I] \times [A]^{-1} = [A]$ (D) $[I] \times [A] = [A]^{-1}$

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The graph below represents the path of a rock thrown from the top of a cliff. What is the value of c in the quadratic equation $y = ax^2 + bx + c$ that describes the height of the rock?

(A) 0
(B) 5
(C) 30
(D) 50

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Mr. Burke is shot from a cannon. His height (h), in metres, after t seconds is given by $h = -4.9t^2 + 20t + 1.8$. How high above the ground is he at $t = 1.5s$?

(A) 20.8 (B) 24.5 (C) 42.8 (D) 85.8

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Which describes the graph?

(A) Neither Periodic nor Sinusoidal
(B) Periodic
(C) Periodic and Sinusoidal
(D) Sinusoidal

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The graph represents the distance, in metres, of a child from her parents as she rides a merry-go-round. What is the radius of the merry-go-round?

(A) 4
(B) 5
(C) 8
(D) 9

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Which mapping rule will transform $y = \cos(x)$ to the relation $-\frac{1}{2}(y - 1) = \cos(x + 30^\circ)$?

(A) $(x, y) \rightarrow (x - 30^\circ, \frac{1}{2}y + 1)$ (B) $(x, y) \rightarrow (x + 30^\circ, -\frac{1}{2}y - 1)$
 (C) $(x, y) \rightarrow (x - 30^\circ, 2y + 1)$ (D) $(x, y) \rightarrow (x - 30^\circ, -2y + 1)$

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What is the equation of the sinusoidal axis for the function $-\frac{1}{2}(y - 5) = \cos 3(x - 50^\circ)$?

(A) $y = -5$ (B) $y = -2$ (C) $y = 2$ (D) $y = 5$

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What is the period, in degrees, for the function $2(y + 4) = \sin 3(x - 28^\circ)$?

(A) 120 (B) 360 (C) 540 (D) 1080

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What is the range of the sinusoidal function?

(A) $\{x | 3 \leq x \leq 7, x \in \mathbb{R}\}$
 (B) $\{x | 3 < x < 7, x \in \mathbb{R}\}$
 (C) $\{y | 3 \leq y \leq 7, y \in \mathbb{R}\}$
 (D) $\{y | 3 < y < 7, y \in \mathbb{R}\}$

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20. The equation $\frac{1}{5}(y + 3) = \sin x$ is a transformation of $y = \sin x$. What are the characteristics of the resulting sinusoidal graph?

(A) amplitude of $\frac{1}{5}$, sinusoidal axis of $y = -3$

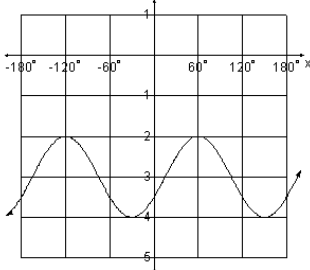
(B) amplitude of $\frac{1}{5}$, sinusoidal axis of $y = 3$

(C) amplitude of 5, sinusoidal axis of $y = -3$

(D) amplitude of 5, sinusoidal axis of $y = 3$

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If the initial equation is $y = \cos x$, what is the equation for the transformation shown?



(A) $y - 3 = \cos \frac{1}{2}(x - 60^\circ)$

(B) $y - 3 = \cos 2(x - 60^\circ)$

(C) $y + 3 = \cos \frac{1}{2}(x - 60^\circ)$

(D) $y + 3 = \cos 2(x - 60^\circ)$

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22. In which quadrant of the unit circle is both sine and cosine negative?

(A) 1 (B) 2 (C) 3 (D) 4

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The point $(1,0)$ on the unit circle is rotated 390° . What are the coordinates of the new point?

(A) $(-\frac{\sqrt{3}}{2}, \frac{1}{2})$ (B) $(-\frac{1}{2}, \frac{\sqrt{3}}{2})$

(C) $(\frac{1}{2}, \frac{\sqrt{3}}{2})$ (D) $(\frac{\sqrt{3}}{2}, \frac{1}{2})$

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24. Which angle, in degrees, is co-terminal with 50° ?

- (A) 130 (B) 230 (C) 310 (D) 410

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25. What is the exact value of $\cos^2 45^\circ + \sin 30^\circ$?

- (A) $\frac{-\sqrt{2}+1}{2}$ (B) 1 (C) $\frac{5}{4}$ (D) $\frac{\sqrt{2}+1}{2}$

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26. What is the exact value of $4 \cos(120^\circ) \sin(315^\circ)$?

- (A) $\sqrt{2}$ (B) $\sqrt{3}$ (C) $\sqrt{6}$ (D) $2\sqrt{2}$

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27. What are the solutions of the equation $\sin x = \frac{\sqrt{2}}{2}$?

- (A) $x = \begin{cases} 45^\circ + 360^\circ k, k \in I \\ 135^\circ + 360^\circ k, k \in I \end{cases}$ (B) $x = \begin{cases} 45^\circ + 360^\circ k, k \in I \\ 315^\circ + 360^\circ k, k \in I \end{cases}$
 (C) $x = \begin{cases} 135^\circ + 360^\circ k, k \in I \\ 225^\circ + 360^\circ k, k \in I \end{cases}$ (D) $x = \begin{cases} 225^\circ + 360^\circ k, k \in I \\ 315^\circ + 360^\circ k, k \in I \end{cases}$

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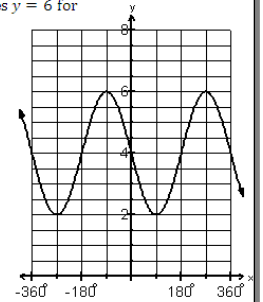
If $\cos \theta = -\frac{1}{2}$ and $0^\circ \leq \theta \leq 360^\circ$, what are the values of θ ?

- (A) $60^\circ, 120^\circ$ (B) $60^\circ, 300^\circ$ (C) $120^\circ, 240^\circ$ (D) $240^\circ, 300^\circ$

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The graph of $y = -2 \sin(x) + 4$ is given. When does $y = 6$ for $-360^\circ < x < 360^\circ$?

- (A) $-450^\circ, -90^\circ, 270^\circ, 630^\circ$
 (B) $-360^\circ, -180^\circ, 0^\circ, 180^\circ, 360^\circ$
 (C) $-180^\circ, 0^\circ, 180^\circ$
 (D) $-90^\circ, 270^\circ$



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30. Which of the following systems has no solution?

- | | |
|-------------------|-------------------|
| (A) $2x + 8y = 3$ | (C) $2x - 8y = 3$ |
| $-x + 4y = 1.5$ | $x - 4y = -1.5$ |
| (B) $2x + 8y = 3$ | (D) $2x - 8y = 3$ |
| $x - 4y = 1.5$ | $x + 4y = -1.5$ |

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What is the solution to the system of equations represented by the matrix multiplication

$$\begin{bmatrix} 2 & 3 \\ -4 & 7 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 5 \\ 29 \end{bmatrix}?$$

- (A) $\begin{bmatrix} -23 \\ -2 \end{bmatrix}$ (B) $\begin{bmatrix} -16 \\ -15 \end{bmatrix}$ (C) $\begin{bmatrix} -2 \\ 3 \end{bmatrix}$ (D) $\begin{bmatrix} 97 \\ 183 \end{bmatrix}$

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32. What is the solution for the following system of equations?

$$\begin{aligned} 2x - 3y &= 13 \\ 2x + 7y &= 3 \end{aligned}$$

(A) $\left(\frac{7}{2}, 1\right)$ (B) $(5, -1)$ (C) $(5, 7)$ (D) $\left(\frac{27}{2}, 4\right)$

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33. What is the determinant of the matrix $\begin{bmatrix} 11 & 12 \\ 9 & 7 \end{bmatrix}$?

(A) -69 (B) -31 (C) 31 (D) 69

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Megan went to the store and picked up 3 bottles of juice and 2 bags of chips for \$5.95. Amanda went to the same store and bought a bottle of juice and 2 bags of chips for \$3.45. If j represents the cost of a bottle of juice and c represents the cost of a bag of chips, which system models this situation?

(A) $2c + 3c = 5.95$ (C) $2j + 2c = 5.95$
 $2j + j = 3.45$ (B) $3j + c = 3.45$
 (B) $2j + 3c = 5.95$ (D) $3j + 2c = 5.95$
 $2c + j = 3.45$ (C) $j + 2c = 3.45$

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35. Which matrix multiplication is equivalent to the following system?

$$\begin{aligned} 2x + 3y &= -9 \\ -4x + 5y &= 16 \end{aligned}$$

(A) $\begin{bmatrix} 2 & 3 \\ -4 & 5 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -9 \\ 16 \end{bmatrix}$ (C) $\begin{bmatrix} 2 & 3 \\ -4 & 5 \end{bmatrix} \begin{bmatrix} y \\ x \end{bmatrix} = \begin{bmatrix} -9 \\ 16 \end{bmatrix}$
 (B) $\begin{bmatrix} 5 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} -9 \\ 16 \end{bmatrix}$ (D) $\begin{bmatrix} 5 & -3 \\ 4 & 2 \end{bmatrix} \begin{bmatrix} y \\ x \end{bmatrix} = \begin{bmatrix} -9 \\ 16 \end{bmatrix}$

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Given $A = \begin{bmatrix} 4 & 3 \\ -2 & 1 \end{bmatrix}$ and $I = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$, which of the following statements is true?

(A) $\frac{1}{A} \cdot A = I$ (B) $A \cdot A = I$ (C) $A^{-1} \cdot A = I$ (D) $A^{-1} + A = I$

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The following graph represents the cost structure for four taxi companies - Albert's Cabs, Barry's Ride, Connie's Shuttle Service, and Danny's Taxi. If you are taking a 12km trip, which company should you use?

(B) Albert's
(C) Barry's
(D) Connie's
(E) Danny's

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38. What is the inverse of $\begin{bmatrix} -2 & 4 \\ -3 & 5 \end{bmatrix}$?

(A) $\begin{bmatrix} -1 & 2 \\ -3 & 5 \\ 2 & 2 \end{bmatrix}$ (B) $\begin{bmatrix} 2 & -3 \\ 4 & -5 \end{bmatrix}$ (C) $\begin{bmatrix} 5 & -2 \\ 2 & -1 \end{bmatrix}$ (D) $\begin{bmatrix} 5 & -4 \\ 3 & -2 \end{bmatrix}$

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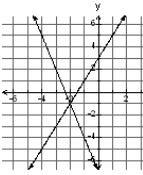
39. Which system of equations is equivalent to $\begin{cases} x + 2y = 7 \\ -x - y = 4 \end{cases}$?

(A) $\begin{cases} x + 2y = 7 \\ 2x + 2y = 8 \end{cases}$ (C) $\begin{cases} 2x + 4y = 14 \\ x + y = -4 \end{cases}$
 (B) $\begin{cases} 2x + 2y = 14 \\ x + y = 4 \end{cases}$ (D) $\begin{cases} 2x + 4y = -14 \\ 2x + 2y = -8 \end{cases}$

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What is the solution to the system of equations graphed below?

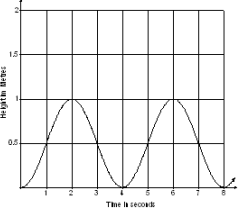
(A) $(-2, -1)$
 (B) $(-2, 1)$
 (C) $(-1, -2)$
 (D) $(-1, 2)$



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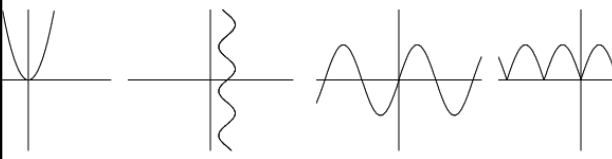
41. The graph below shows the height of a pebble stuck in a tire tread. What is the radius of the tire, in metres?

(A) -0.5
 (B) 0.5
 (C) 1
 (D) 2



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Which of the following graphs represents a function that is periodic and sinusoidal?



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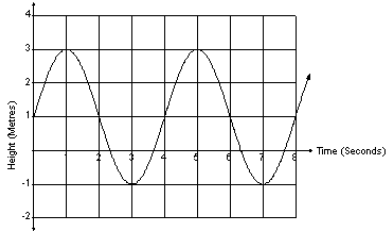
What is the amplitude of the graph represented by the equation $3(y + 6) = \sin\left(\frac{1}{2}(x - 90^\circ)\right)$?

(A) -6 (B) $\frac{1}{3}$ (C) 3 (D) 6

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The graph below shows the height of the nail on a water wheel with respect to the water level. How many seconds does it take to make one complete revolution?

- (A) 2
- (B) 3
- (C) 4
- (D) 5



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Which of the following mapping rules will transform $y = \cos(x)$ to the relation

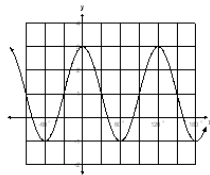
$$\frac{1}{5}(y+1) = \cos 2(x+45^\circ)?$$

- (A) $(x,y) \rightarrow \left(\frac{1}{2}x+45^\circ, 5y-1\right)$
- (B) $(x,y) \rightarrow \left(2x+45^\circ, \frac{1}{5}y+1\right)$
- (C) $(x,y) \rightarrow \left(\frac{1}{2}x-45^\circ, 5y-1\right)$
- (D) $(x,y) \rightarrow \left(2x-45^\circ, \frac{1}{5}y-1\right)$

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What is the range of the graph to the right?

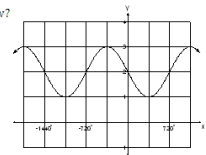
- (A) $\{x \mid x \in \mathbb{R}\}$
- (B) $\{x \mid -1 \leq x \leq 3, x \in \mathbb{R}\}$
- (C) $\{y \mid y \in \mathbb{R}\}$
- (D) $\{y \mid -1 \leq y \leq 3, y \in \mathbb{R}\}$



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What is the equation of the sinusoidal axis of the graph below?

- (A) $x = 1$
- (B) $x = 2$
- (C) $y = 1$
- (D) $y = 2$



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If the image of $y = \cos(x)$ is given by $(x, y) \rightarrow \left(\frac{1}{3}x + 45^\circ, \frac{1}{2}y - 7\right)$, what is the period of the image?

- (A) 120° (B) 180° (C) 720° (D) 1080°

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49. Which of the following angles is coterminal with -65° ?

- (A) -245° (B) 65° (C) 115° (D) 295°

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If $\sin \theta = 0.6428$, what are the values of θ to the nearest degree if $0^\circ \leq \theta < 360^\circ$?

- (A) $40^\circ, 140^\circ$ (B) $40^\circ, 320^\circ$
 (C) $140^\circ, 220^\circ$ (D) $220^\circ, 320^\circ$

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What is the exact value, in simplest form, of the expression $\frac{\cos(210^\circ)}{\sin(-30^\circ)}$?

- (A) -1 (B) $\frac{\sqrt{3}}{3}$ (C) 1 (D) $\sqrt{3}$

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The graph of $y = 2\cos x - 1$ is provided below. What are the solutions of the equation $2\cos x - 1 = -3$?

(A) $x = 180^\circ k, k \in I$
 (B) $x = 360^\circ k, k \in I$
 (C) $x = 90^\circ + 360^\circ k, k \in I$
 (D) $x = 180^\circ + 360^\circ k, k \in I$

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The point $(1, 0)$ on the unit circle is rotated 200° . What are the coordinates of the new point?

(A) $(-0.9397, -0.3420)$ C) $(-0.3420, -0.9397)$
 (B) $(0.3640, -0.3420)$ D) $(0.9397, 0.3640)$

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54. What is the value of θ if $\cos \theta = -\frac{\sqrt{3}}{2}$ and $0^\circ \leq \theta \leq 180^\circ$?

(A) 30° C) 120°
 (B) 150° D) 210°

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55. What quadrant is θ in if $\cos \theta = -0.1736$ and $\sin \theta = 0.9848$?

(A) 1
 (B) 2
 (C) 3
 (D) 4

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Part II:

1. Solve using either substitution **OR** elimination.

$$\begin{aligned} x + y - 2z &= -5 \\ 2x + 3y - z &= 7 \\ 3x - y + 4z &= 5 \end{aligned}$$

For art class, Ms. Picasso purchases 3 cans of red paint and 2 cans of blue paint for a total of 14L of paint. The following week, she purchased 5 cans of red paint and 4 cans of blue paint for a total of 26L of paint. Create a system of equations to represent this information and, **using matrices** find the amount of paint in each can.

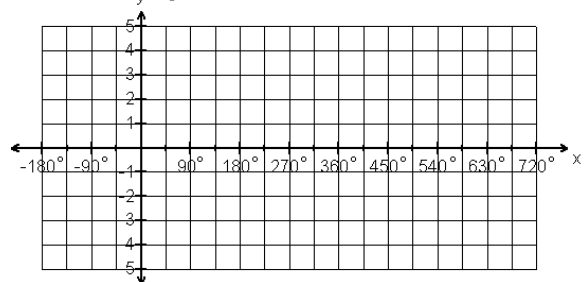
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3. A remote controlled airplane is launched from an initial height of 2 m. At $t = 1$ s, it is at a height of 3 m. At $t = 2$ s, it is at a height (h) of 1 m. Set up and solve a system of equations to determine the quadratic function, of the form $h = at^2 + bt + c$, that models the path of the remote-controlled airplane.

Using the mapping rule **and** a table of values, graph the relation:

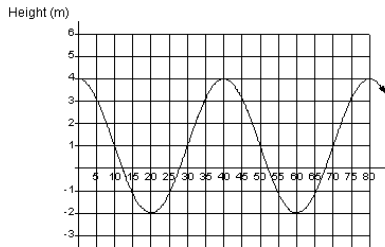
$$-(y - 3) = \cos\frac{1}{2}(x + 90^\circ)$$



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A pail attached to a water wheel empties into an animal trough on the ground. The height of the pail, in metres (m), measured over time in minutes behaves sinusoidally as shown on the graph. Algebraically determine the equation of the sinusoidal function that models this situation.



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7. Solve the following system of equations using either substitution or elimination:

$$-3x + 5y + z = -20$$

$$2x - 2y + 3z = 18$$

$$4x + 2y + 3z = 18$$

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The student council is having a dance as a fundraiser. They are selling two kinds of tickets: singles and couples. On the first day, 39 singles tickets and 24 couples tickets are sold for a total of \$268.50. On the second day, 13 singles tickets and 18 couples tickets are sold for a total of \$144.50. Create a system of equations to represent this information and, using matrices, find the cost for each type of ticket.

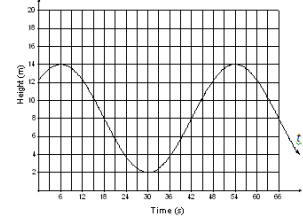
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9. An arrow is fired into the air from a height of 1 metre. After 2 seconds, the arrow is 9 metres in the air. After 4 seconds, the arrow is 13 metres in the air. Set up and solve a system of equations to determine the quadratic relation, of the form $h(t) = at^2 + bt + c$, that models this situation. Use this relation to determine the height, $h(t)$, of the arrow at $t=10$ seconds.

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10. Graph the following relation: $-\frac{1}{4}(y+2) = \cos 2(x-90^\circ)$.

Jack is riding a Ferris wheel. The graph below shows his height above the ground with relation to time. Determine the equation of the function in terms of sine or cosine that describes Jack's height above the ground in relation to time.



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12. Simplify the following expression, expressing your answer in EXACT simplest form:

$$3 \sin(225^\circ) \cos(135^\circ) + \cos(330^\circ)$$

13. Solve $2 \sin x + \sqrt{2} = 0$ where $0^\circ \leq x < 360^\circ$.

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