

SECTION I - Matrices

Perform the indicated operation.

1. $7 \begin{bmatrix} 1 & 2 & 3 \\ -1 & 0 & -4 \end{bmatrix} - 4 \begin{bmatrix} 4 & 1 & 3 \\ 1 & 2 & -1 \end{bmatrix}$

2. $\begin{bmatrix} 1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix} \begin{bmatrix} 1 & 3 \\ 2 & 4 \\ 3 & 0 \end{bmatrix}$

3. $\begin{vmatrix} 7 & 9 \\ 6 & -8 \end{vmatrix}$

4. $\begin{bmatrix} 1 & 3 \\ 2 & 4 \\ 3 & 0 \end{bmatrix} \begin{bmatrix} 1 & 2 & 3 \\ 1 & 5 & 7 \end{bmatrix}$

5. $\begin{bmatrix} 4 & 3 & 1 \\ -2 & 0 & 5 \\ 1 & 6 & 2 \end{bmatrix}$

6. Inverse of $\begin{bmatrix} 3 & 2 \\ 7 & -5 \end{bmatrix}$

7. $\det \begin{bmatrix} 4 & -1 \\ -9 & 2 \end{bmatrix}$

8. inverse of $\begin{bmatrix} -5 & -18 \\ 2 & 7 \end{bmatrix}$

9. $\det \begin{bmatrix} 1 & -1 & -2 \\ -3 & 2 & -4 \\ -3 & -2 & -4 \end{bmatrix}$

10. $g \begin{bmatrix} -2 & 3 & 6 \\ 0 & -1 & 7 \\ -5 & 3 & 6 \end{bmatrix}$

11. $\begin{bmatrix} -1 & 5 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} 0 & 3 \\ 4 & -6 \end{bmatrix}$

12. $\begin{vmatrix} 2 & -3 \\ 5 & 4 \end{vmatrix}$

13. $\begin{vmatrix} 0 & 1 & -2 \\ 5 & 3 & 0 \\ -1 & 2 & -3 \end{vmatrix}$

14. $\begin{bmatrix} -1 & 5 \\ 3 & -2 \end{bmatrix} \begin{bmatrix} 0 & 3 \\ 4 & -6 \end{bmatrix}$

15. Solve the matrix equation. $\begin{bmatrix} 1 & -1 \\ 2 & -3 \end{bmatrix} X = \begin{bmatrix} -4 \\ 8 \end{bmatrix}$

16. Find the values of the variables: $\begin{bmatrix} 2x-5 & a \\ b & y+6 \end{bmatrix} = \begin{bmatrix} 5 & -2 \\ 7 & -4 \end{bmatrix}$

Write each system of equations as a matrix equation. Then solve the system.

17. $9x - 3y = 25$
 $2x + 7y = 43$

$x - y + 2z = 22$
18. $3x - 5y + 7z = 20$
 $9x + 3y - 8z = 8$

SECTION II – Conic Sections

Sketch the graph of each conic section. For parabolas, identify the vertex and focus. For circles, identify the center and radius. For ellipses and hyperbolas identify the center, vertices, and foci.

19. $\frac{x^2}{16} - \frac{(y+1)^2}{16} = 1$

20. $(x-2)^2 + (y-3)^2 = 15$

21. $\frac{(x-1)^2}{9} + \frac{(y-2)^2}{25} = 1$

22. $y-3 = (x-4)^2$

Express each of the following equations in standard form. And identify the conic section.

23. $4x^2 + 9y^2 - 56x + 16 = 0$

24. $x^2 + y^2 + 14x - 20y + 113 = 0$

25. $4x^2 - 9y^2 + 40x + 108y - 260 = 0$

26. $3x^2 + 24x - y + 20 = 0$

27. $9x^2 + 4y^2 + 54x - 64y + 301 = 0$

28. $x^2 + 9y^2 - 2x + 90y + 190 = 0$

29. Write an equation of a hyperbola with vertices (3, -2) and (-9, -2), and foci (7, -2) and (-13, -2).

30. Find the equation of the circle with center (2, -5) and radius 16.

31. Find the focus and directrix for the parabola $y-7 = \frac{1}{20}(x-2)^2$.

32. Write the equation of an ellipse with a center at (2,3), a vertex at (2,7) and a co-vertex at (5, 3).

33. Write an equation of a hyperbola with vertices (-2, ±4) and foci (-2, ±6).

SECTION III – Trigonometry

Convert to radians:

34. $\theta = 552^\circ$

35. $\theta = 80^\circ$

36. $\theta = 410^\circ$

37. $\theta = -120^\circ$

Convert to Degrees:

38. $\theta = \frac{95\pi}{72}$

39. $\theta = 7\pi$

40. $\theta = \frac{4\pi}{5}$

41. $\theta = \frac{-7\pi}{12}$

42. Write in DMS form
 $\theta = 27.582^\circ$

43. Write as a degree in decimal form
 $\theta = 28^\circ 37' 45''$

44. Find the angle between 4π and 6π that is co-terminal to $\frac{4\pi}{3}$.

Sketch each angle in standard position.

45. 215°

46. -210°

47. $\frac{5\pi}{4}$

48. $-\frac{7\pi}{6}$

Find the measure of the angle between 0 and 360° (if $^\circ$) or between 0 and 2π (if radians) coterminal with each angle.

49. 839°

50. -87°

51. $\frac{13\pi}{4}$

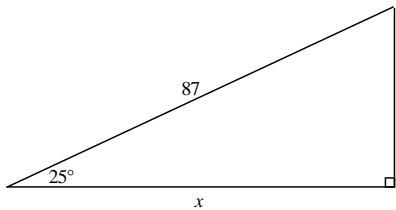
52. $-\frac{22\pi}{5}$

In $\triangle ABC$, $\angle C$ is a right angle. Find the remaining sides and angles. Write your answers in the box. Round your answers to the nearest tenth.

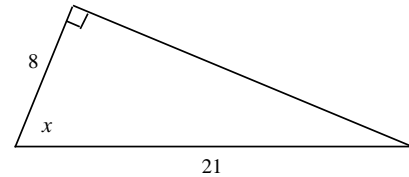
53. $a = 36, b = 23$

54. $a = 14, c = 23$

55. Find the length x . Round to the nearest tenth.



56. Find the measure of x in the right triangle.



Find the exact value of each of the following.

57. $\csc -330^\circ$

58. $\cot 150^\circ$

59. $\sin 585^\circ$

60. $\tan 270^\circ$

61. $\cos -300^\circ$

62. $\sec \frac{25\pi}{6}$

63. $\sin -\frac{5\pi}{4}$

64. $\cot \frac{4\pi}{3}$

65. $\csc \frac{5\pi}{6}$

66. $\cos \frac{5\pi}{3}$

67. Find the reference angle for: $\frac{17\pi}{12}$

68. $\sin \theta = -\frac{13}{15}$ and $\tan \theta < 0$, find $\sec \theta$.

69. Given a circle with radius 48 cm, find the length of the arc intercepted by a central angle of $\frac{7\pi}{15}$ radians.

70. Given a circle with radius 36 cm, find the area of the sector intercepted by a central angle of 130° .

A Ferris Wheel makes 9 rotations in a 5 minute ride. If a car on the wheel is 37 feet from its axis (center), answer the following.

71. What is the angular speed of the car (in degrees per second)?

72. How fast is a person riding in the car travelling (in feet per second)?

SECTION IV – Trigonometric Graphs

Find (a) the amplitude (or vertical stretch), (b) the vertical shift (including direction), (c) phase shift (including direction), and period for each of the following.

73. $y = -5 \cos 7(x - 2\pi) + 1$

74. $y = 4 \tan 3\left(x - \frac{\pi}{2}\right)$

75. $y = 3 \sin 2(x - \pi)$

76. $y = 4 \sec\left(x + \frac{\pi}{2}\right)$

77. $y = \cot(x)$

78. $y = \csc 2\left(x - \frac{\pi}{2}\right) + 1$

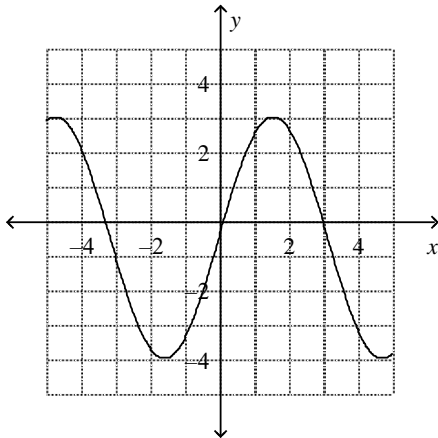
79. State the amplitude, period, and the vertical shift of $f(x) = 2\sin\frac{1}{2}\theta - 1$

80. State the period and the phase shift of $y = \tan 3\left(x - \frac{\pi}{6}\right)$

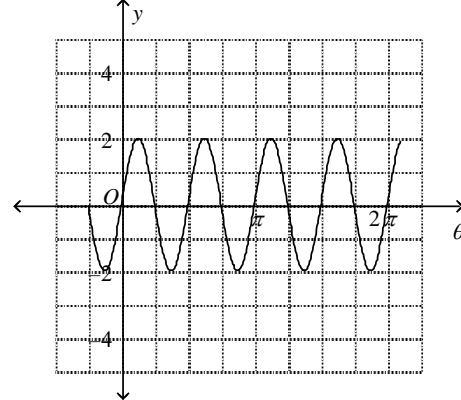
81. Write the sine function with the following: Amp. = 2, Per. = $\frac{\pi}{3}$, P.S. = $-\pi$, V.S. = -2

82. Write the cosine function with the following: Amp. = $|-3|$, Per. = π , P.S. = right $\frac{\pi}{2}$, V.S. = 4

83. Find the amplitude of the periodic function.



84. Write the equation for the sine function shown below.



Graph the following functions from 0 to 2π .

85. $y = 4 \sin 4\theta$

86. $y = 4 \cos \frac{1}{2} \theta$

87. $y = \tan 2x$

88. $y = \sec 4(x - \pi)$

89. $y = \csc \frac{1}{2} x + 1$

90. $y = \cot 3\left(x - \frac{\pi}{6}\right)$

91. A team of biologists have discovered a new creature whose temperature appears to vary sinusoidally over time. A maximum temperature of 140 degrees occurs 20 minutes after they start the exam. A minimum temperature of 98 degrees occurs 48 minutes after they start the exam. The team wants you to write an equation that they can use to predict the temperature at any time. Write an equation for this info.

Find the exact value of each:

92. $\sin^{-1}\left(\frac{-\sqrt{3}}{2}\right)$

93. $\arctan 1$

94. $\cos^{-1}(\sin -60^\circ)$

95. $\cos^{-1}\left(\cos \frac{\pi}{2}\right)$

96. $\cos\left(\tan^{-1} \frac{\pi}{4}\right)$

97. $\tan(\cos^{-1}(0) + \sin^{-1} \frac{1}{2})$

98. $\tan\left(\arccos\left(\frac{1}{x}\right)\right)$

Describe the transformation of each parent inverse trig function:

99. $y = 3\arcsin(\theta + 5) + \frac{\pi}{4}$

100. $y = -0.5 \tan^{-1}\left(\frac{1}{2}\theta\right)$