TRIGONOMETRY I

JAN 1997

1. Convert $256°$ to radians. (Accurate to 2 decimal places.)

   A. 2.23
   B. 3.39
   C. 4.47
   D. 8.93

2. Determine the period of the function $f(x) = 3\sin 4x + 1$.

   A. $\frac{\pi}{2}$
   B. $\frac{2\pi}{3}$
   C. 6π
   D. 8π

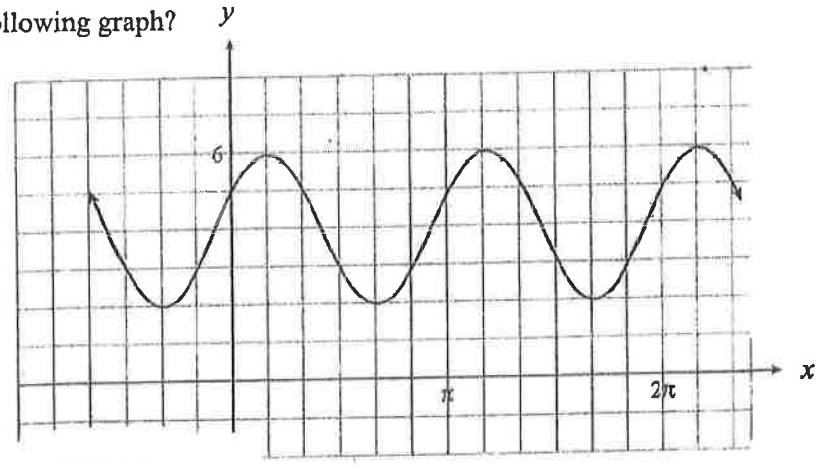
3. If the point $(-4,\ 2)$ lies on the terminal arm of an angle θ in standard position, determine the exact value of $\csc\theta$.

   A. $-\sqrt{5}$
   B. $-\frac{\sqrt{5}}{2}$
   C. $\frac{\sqrt{5}}{2}$
   D. $\sqrt{5}$

4. Solve: $2\cot x + 3 = 0$, where $0 \le x < 2\pi$ (Accurate to 2 decimal places.)

   A. 0.59 , 3.73
   B. 0.98 , 4.12
   C. 2.16 , 5.30
   D. 2.55 , 5.70

5. Which equation describes the following graph?

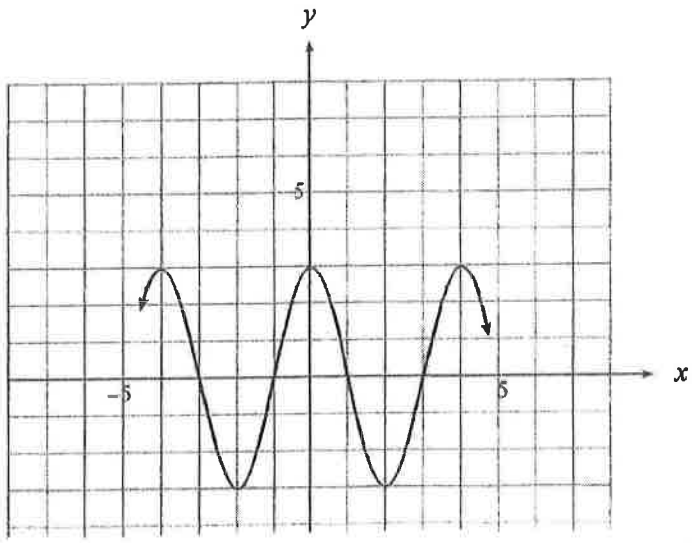


   A. $y = 2\cos 2\left(x - \frac{\pi}{6}\right) + 4$
   B. $y = 2\cos 2\left(x + \frac{\pi}{6}\right) + 4$
   C. $y = 4\cos\left(x + \frac{\pi}{6}\right) + 2$
   D. $y = 4\cos\left(x - \frac{\pi}{6}\right) + 2$

6. Convert $\frac{5\pi}{6}$ radians to degrees.

A. 108°
B. 150°
C. 216°
D. 300°

7. Determine the period of the trigonometric function graphed below.



A. 2
B. 3
C. 4
D. 6

8. Evaluate $\sec 0.156$ to 3 decimal places.

A. 0.992
B. 1.012
C. 1.414
D. 6.436

9. Given two functions, $f(x) = \sin\left(x - \frac{\pi}{4}\right)$ and $g(x) = \cos(x - a)$, determine the smallest positive value for a so that the graphs are identical.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. $\frac{3\pi}{4}$

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

10. Convert 162° to radian measure.

A. 0.90
B. 2.83
C. 508.94
D. 9 281.92

11. Determine the amplitude of the graph of $y = -2\cos 3x$.

A. -2
B. 2
C. 3
D. $\frac{2\pi}{3}$

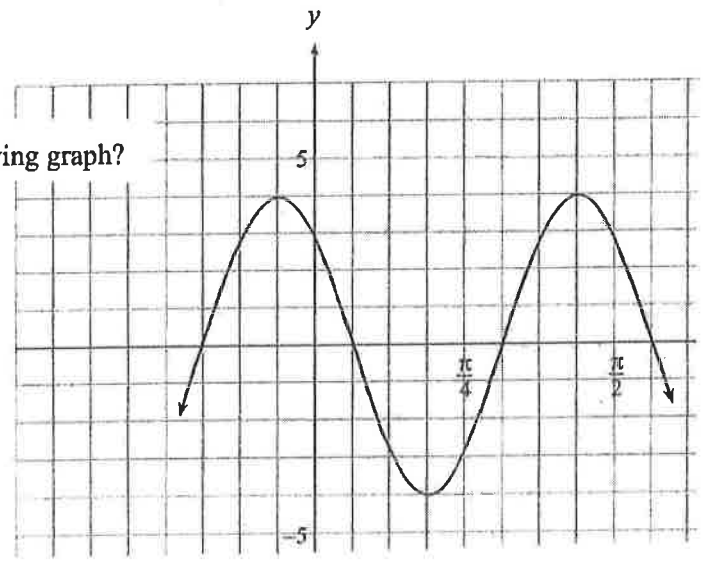
12. Evaluate: $\csc 1.2$ (Accurate to 2 decimal places.)

A. 0.67
B. 0.74
C. 1.07
D. 2.76

13. If $\sin x = \frac{3}{4}$, determine the smallest positive angle x, in radians. (Accurate to 2 decimal places.)

A. 0.68
B. 0.72
C. 0.85
D. 1.47

14. Which equation describes the following graph?



A. $y = -4\sin 4\left(x - \frac{\pi}{16}\right)$

B. $y = 4\sin 4\left(x - \frac{\pi}{16}\right)$

C. $y = 4\sin 4\left(x - \frac{3\pi}{16}\right)$

D. $y = -4\sin 4\left(x + \frac{3\pi}{16}\right)$

15. If $\sin\theta = a$ and $0 < \theta < \frac{\pi}{2}$, determine an expression for $\cos(\pi + \theta)$.

A. $1 - a$

B. $a - 1$

C. $\sqrt{1 - a^2}$

D. $-\sqrt{1 - a^2}$

16. Convert 4 radians to degrees. (Accurate to the nearest degree.)

A. 13°
B. 115°
C. 229°
D. 720°

17. Determine the amplitude of the graph of $y = -4\cos 2x$.

A. -4
B. 2
C. 4
D. 8

18. Solve: $3\cos x + 2 = 0$, $0 \le x < 2\pi$ (Accurate to 2 decimal places.)

A. 0.84, 2.30
B. 0.84, 5.44
C. 2.30, 3.98
D. 2.36, 3.93

19. Evaluate: $\csc\frac{3\pi}{8}$ (Accurate to 2 decimal places.)

A. 0.75
B. 1.08
C. 1.18
D. 2.61

20. Determine the number of asymptotes of the graph of $y = \tan x$ over the interval $-2\pi \le x \le 2\pi$.

A. 2
B. 4
C. 6
D. 8

21. Find the period of the sine function which has a minimum point at $\left(\frac{\pi}{3}, 1\right)$ and its nearest maximum point to the right at $\left(\frac{2\pi}{3}, 5\right)$.

A. $\frac{\pi}{3}$

B. $\frac{2\pi}{3}$

C. $\frac{4\pi}{3}$

D. 2π

JAN 1999

22. Convert $322°$ to radians.

A. 0.66
B. 2.81
C. 5.62
D. 11.24

23. Which expression is equivalent to $2\csc\frac{\pi}{7}$?

A. $2\sin\frac{7}{\pi}$

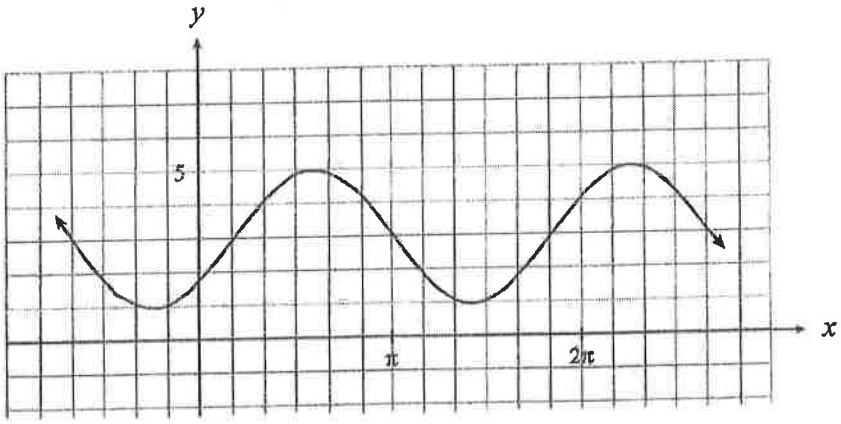
B. $\dfrac{1}{2\sin\frac{\pi}{7}}$

C. $\dfrac{2}{\sin\frac{7}{\pi}}$

D. $\dfrac{2}{\sin\frac{\pi}{7}}$

24. Solve: $3\tan x + \sqrt{15} = 0$ where $0 \le x < 2\pi$

A. 0.91 , 4.05
B. 2.23 , 4.05
C. 2.23 , 5.37
D. 4.05 , 5.37



25. Determine the amplitude of the sine function shown in the graph above.

A. 2
B. 3
C. 4
D. 5

26. Determine the period of the sine function shown in the graph above.

A. $\frac{5\pi}{6}$

B. π

C. $\frac{5\pi}{3}$

D. $\frac{11\pi}{6}$

27. If $\sec\theta = -\frac{5}{3}$ and angle θ terminates in quadrant III, which point must be on the terminal side of θ ?

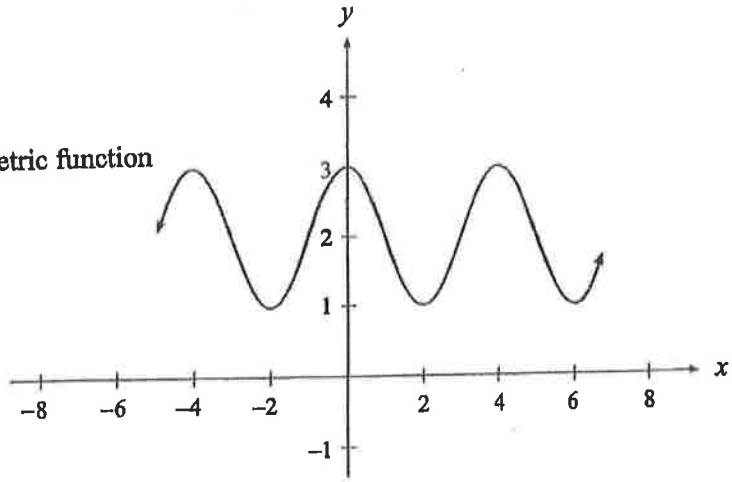
A. $(-6, -10)$
B. $(-10, -6)$
C. $(-8, -6)$
D. $(-6, -8)$

JUN 1999

28. Convert 200° to radians.

A. 2.83
B. 3.49
C. 3.83
D. 4.49

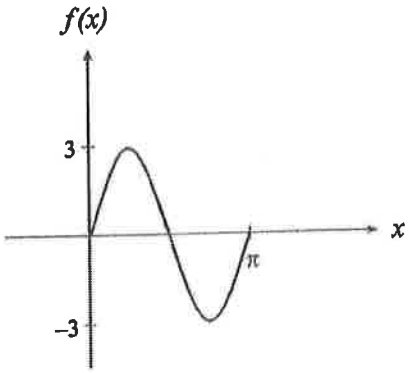
29. Determine the period of the trigonometric function



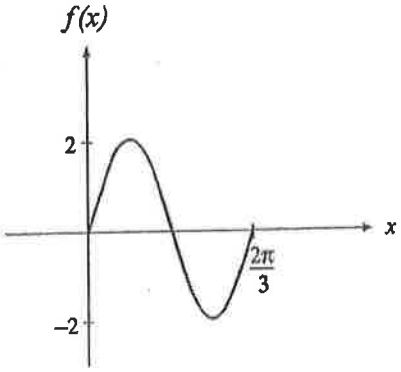
A. 1
B. 2
C. 3
D. 4

30. Which of the following shows one period of the graph of $f(x) = 2\sin 3x$?

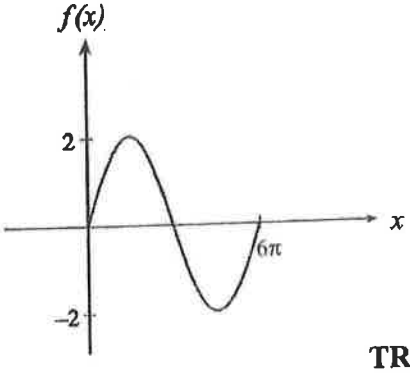
A.



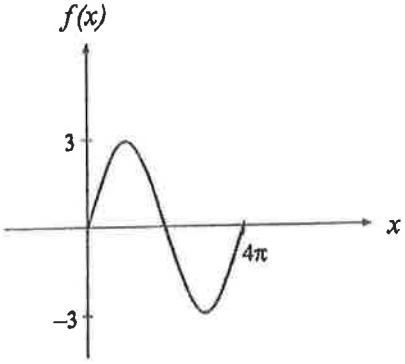
B.



C.



D.



31. If $\cos\theta = \frac{5}{13}$, where θ is in quadrant IV, determine the value of $\cot\theta$.

A. $-\frac{12}{5}$

B. $-\frac{5}{12}$

C. $\frac{5}{12}$

D. $\frac{12}{5}$

32. Evaluate: $\sec\frac{2\pi}{5}$

A. 0.70
B. 1.05
C. 1.43
D. 3.24

33. The range of the trigonometric function $y = a\cos x + b$ is $-2 \le y \le 8$. Determine the value of b.

A. 3
B. 5
C. 6
D. 10

JAN 2000

34. Convert 5 radians to degrees.

A. 0.09°
B. 286.48°
C. 291.39°
D. 318.31°

35. Evaluate: $\cot 4.47$

A. −0.24
B. 0.23
C. 0.25
D. 4.04

36. Determine the maximum value of the function $y = 3\cos 2x - 4$.

A. −2
B. −1
C. 3
D. 7

37. Determine $\csc\theta$ if $(-10, 24)$ lies on the terminal arm of angle θ in standard position.

A. $-\frac{13}{5}$

B. $-\frac{13}{12}$

C. $\frac{13}{12}$

D. $\frac{13}{5}$

38. A sine curve has a zero at -2. The nearest zero to the right is at 3. A maximum point is located between these zeros. If the range of the function is $-1 \le y \le 1$, determine an equation of this function.

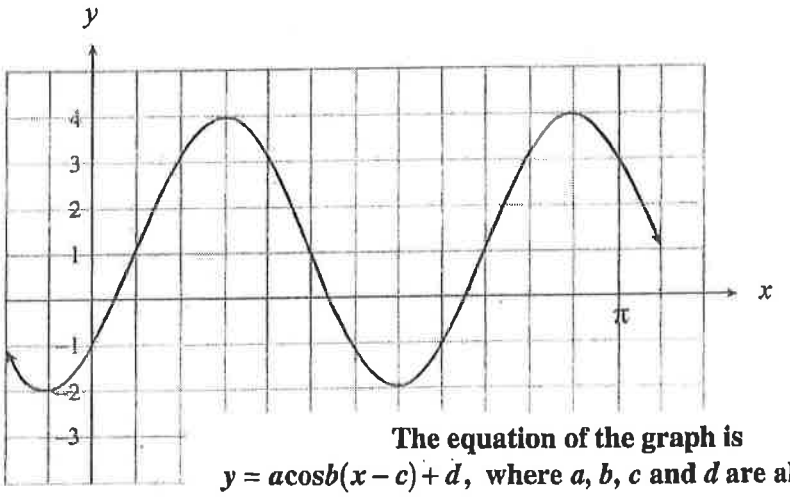
A. $y = \sin\frac{\pi}{5}(x-2)$

B. $y = \sin\frac{2\pi}{5}(x-2)$

C. $y = \sin\frac{2\pi}{5}(x+2)$

D. $y = \sin\frac{\pi}{5}(x+2)$

JUN 2000



The equation of the graph is $y = a\cos b(x-c)+d$, where a, b, c and d are all positive.

39. In the graph above, determine the value of d.

A. 1
B. 2
C. 3
D. 4

40. In the graph above, determine the value of a.

A. 1
B. 2
C. 3
D. 4

41. In the graph above, determine the value of b.

A. $\frac{2}{3}$

B. 3

C. 4

D. 8

42. Evaluate: $\csc\frac{2\pi}{7}$

A. -1.00
B. 0.90
C. 1.28
D. 1.60

43. Convert 3 radians to degrees. (Accurate to the nearest degree.)

A. 150°
B. 172°
C. 180°
D. 540°

44. Solve: $\cot\theta = -3$, $0 \le \theta < 2\pi$

A. 2.34, 5.48
B. 2.80, 5.94
C. 2.82, 5.94
D. 2.82, 5.96

45. The height of a piston in an engine can be determined by the function $h = 20\sin\frac{\pi t}{0.025} + 20$, where height, h, is in centimetres, and time, t, is in seconds. Determine the period of this function.

A. 0.025
B. 0.05
C. 0.25
D. 0.5

JAN 2001

46. Convert 210° to radians.

A. $\frac{7\pi}{12}$
B. $\frac{6\pi}{7}$
C. $\frac{7\pi}{6}$
D. $\frac{12\pi}{7}$

47. Determine the phase shift of the function $y = 4\cos 2\left(x - \frac{\pi}{4}\right) + 5$.

A. $\frac{\pi}{4}$ to the right
B. $\frac{\pi}{2}$ to the right
C. $\frac{\pi}{4}$ to the left
D. $\frac{\pi}{2}$ to the left

48. Solve: $\tan x = 3.2$, $0 \le x < 2\pi$

A. 0.06, 3.20
B. 1.27, 1.87
C. 1.27, 4.41
D. 1.87, 5.02

49. If the point $(-7, -24)$ is on the terminal arm of angle θ in standard position, determine the value of $\csc\theta$.

A. $-\frac{25}{7}$
B. $-\frac{25}{24}$
C. $\frac{7}{25}$
D. $\frac{24}{25}$

50. A sine function has a maximum point at $(4, 32)$ and the nearest minimum point to the right is $(16, 18)$. Determine an equation for this function.

A. $y = 7\sin\frac{\pi}{6}(x-4)+25$

B. $y = 7\sin\frac{\pi}{6}(x+4)+25$

C. $y = 7\sin\frac{\pi}{12}(x-2)+25$

D. $y = 7\sin\frac{\pi}{12}(x+2)+25$

JUN 2001

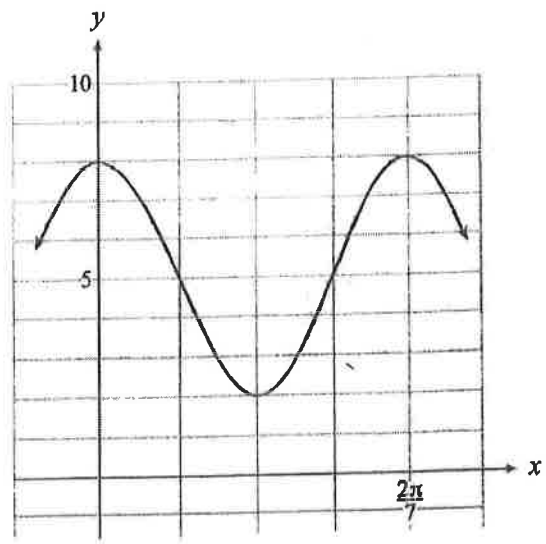
52. Convert 2.1 radians to degrees.

A. 60.16°
B. 120.32°
C. 126.35°
D. 240.64°

53. Solve: $\tan\theta = -1.25$, $0 \le \theta < 2\pi$

A. 0.90, 4.04
B. 2.25, 5.39
C. 2.25, 6.15
D. 3.01, 6.15

54. Determine an equation of the cosine function



A. $y = 3\cos 7x + 2$
B. $y = 3\cos 7x + 5$
C. $y = 6\cos 7x + 5$
D. $y = 8\cos 7x + 2$

51. Which expression below is equivalent to $2\cot\frac{\pi}{5}$?

A. $2\tan\frac{5}{\pi}$

B. $\dfrac{1}{2\tan\frac{\pi}{5}}$

C. $\dfrac{2}{\tan\frac{5}{\pi}}$

D. $\dfrac{2}{\tan\frac{\pi}{5}}$

55. A and B are complementary angles. If $\sin A = \frac{3}{5}$, find the value of $\sec B$.

A. $\frac{3}{5}$

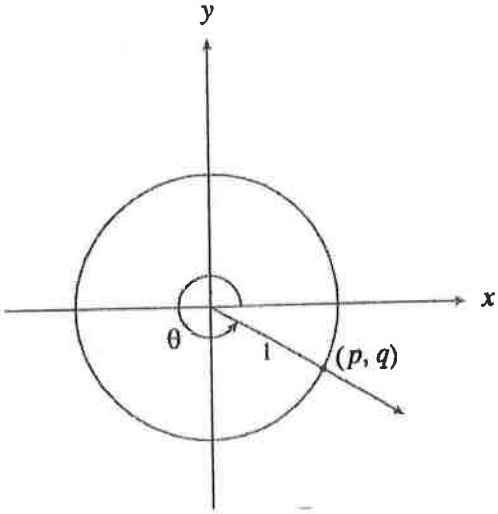
B. $\frac{4}{5}$

C. $\frac{5}{4}$

D. $\frac{5}{3}$

SAMPLE 2001

56. If the diagram below shows a unit circle, determine $\cos\theta$.



A. p
B. q
C. $-p$
D. $-q$

57. Convert 150° to radians.

A. $\frac{2\pi}{3}$

B. $\frac{3\pi}{2}$

C. $\frac{5\pi}{6}$

D. $\frac{6\pi}{5}$

58. Determine the period of the function $y = \tan\frac{\pi}{5}x$.

A. 5

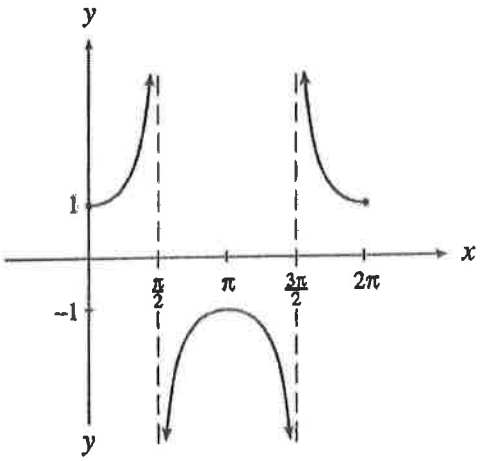
B. 10

C. $\frac{\pi}{5}$

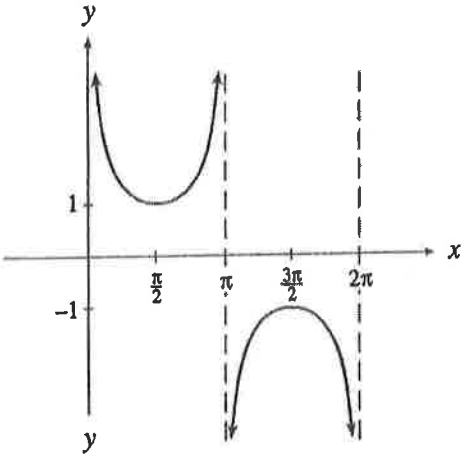
D. $\frac{\pi}{10}$

59. Which graph best represents $y = \sec x$, $0 \le x \le 2\pi$?

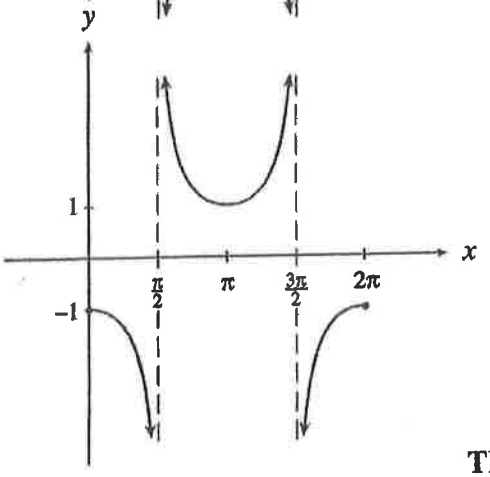
A.



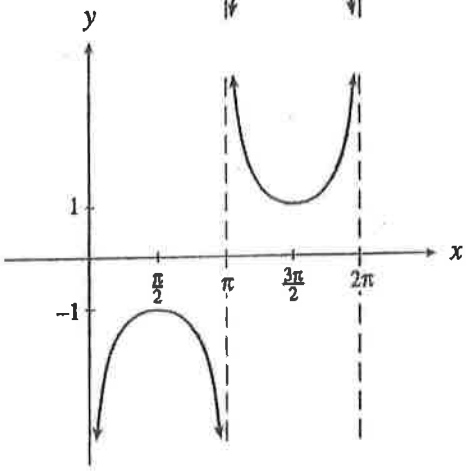
B.



C.



D.



60. Solve: $\sqrt{3}+2\sin x=0$, $0 \le x < 2\pi$ (Give exact solutions.)

A. $\frac{\pi}{3}, \frac{2\pi}{3}$

B. $\frac{4\pi}{3}, \frac{5\pi}{3}$

C. $\frac{\pi}{6}, \frac{5\pi}{6}$

D. $\frac{7\pi}{6}, \frac{11\pi}{6}$

61. In the function $y = a\sin(x-c)+d$ where a, c and d are positive constants, determine the range of the new function formed if a is doubled.

A. $d-\frac{a}{2} \le y \le d+\frac{a}{2}$

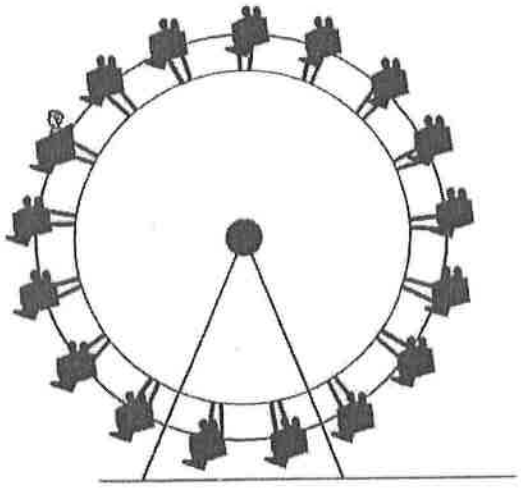
B. $d-2a \le y \le d+2a$

C. $-d-\frac{a}{2} \le y \le -d+\frac{a}{2}$

D. $-d-2a \le y \le -d+2a$

62. The Ferris wheel shown in the diagram has a radius of 16 m and its centre is 18 m above the ground. It rotates once every 60 s. Ethan gets on the Ferris wheel at its lowest point and then the wheel starts to rotate. How long does it take Ethan to reach 29 m above the ground for the first time?

A. 11.12 s
B. 22.24 s
C. 23.92 s
D. 37.76 s



JAN 2002

63. Convert 5.3 radians to degrees.

A. 0.09°
B. 0.18°
C. 151.83°
D. 303.67°

64. Determine the period of $y = 6\cos\frac{2\pi}{15}x+8$.

A. $\frac{2}{15}$

B. $\frac{15}{2}$

C. 15

D. 30

65. Determine the exact value of $\tan\frac{5\pi}{6}$.

A. $-\frac{\sqrt{3}}{2}$

B. $-\frac{1}{\sqrt{3}}$

C. $\frac{1}{\sqrt{3}}$

D. $\frac{\sqrt{3}}{2}$

66. The point $P(m, n)$ is the intersection point of the terminal arm of angle θ in standard position and the unit circle $x^2 + y^2 = 1$. Which expression represents $\sin\theta$?

A. m

B. n

C. $\frac{m}{n}$

D. $\frac{n}{m}$

67. Which of the following is an asymptote of $y = \sec x$?

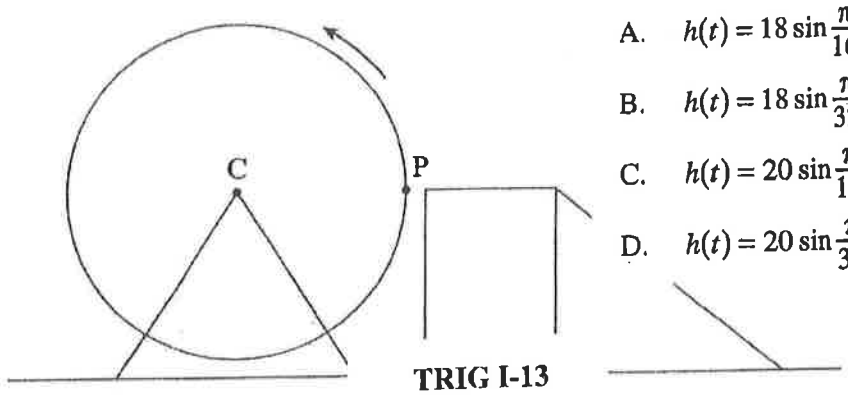
A. $x = 0$

B. $x = \frac{\pi}{4}$

C. $x = \frac{\pi}{2}$

D. $x = \pi$

68. A Ferris wheel has a radius of 18 metres and a centre C which is 20 m above the ground. It rotates once every 32 seconds in the direction shown in the diagram. A platform allows a passenger to get on the Ferris wheel at a point P which is 20 m above the ground. If the ride begins at point P, when the time $t = 0$ seconds, determine a sine function that gives the passenger's height, h, in metres, above the ground as a function of t.



A. $h(t) = 18\sin\frac{\pi}{16}t + 20$

B. $h(t) = 18\sin\frac{\pi}{32}t + 20$

C. $h(t) = 20\sin\frac{\pi}{16}t + 18$

D. $h(t) = 20\sin\frac{\pi}{32}t + 18$

APR 2002

69. Determine the period of $y = \tan x$.

A. 1 radian

B. $\frac{\pi}{2}$ radians

C. π radians

D. 2π radians

70. Given a circle with radius 10 cm, calculate the length of arc a which contains a sector angle $\theta = 2$ radians.

A. 5π cm
B. 10π cm
C. 10 cm
D. 20 cm

71. Find the exact value of $\tan\frac{5\pi}{3}$.

A. $-\sqrt{3}$

B. $-\frac{1}{\sqrt{3}}$

C. $\frac{1}{\sqrt{3}}$

D. $\sqrt{3}$

72. Determine the maximum value of the function $f(x) = a\cos x + d$, where $a > 0$ and $d > 0$.

A. a
B. $d - a$
C. $a + d$
D. $2a + d$

73. The terminal arm of angle θ in standard position passes through point (m, n) where $m > 0$, $n > 0$. Determine the value of $\sin(\pi + \theta)$.

A. $\frac{-n}{\sqrt{m^2 + n^2}}$

B. $\frac{-m}{\sqrt{m^2 + n^2}}$

C. $\frac{n}{\sqrt{m^2 + n^2}}$

D. $\frac{m}{\sqrt{m^2 + n^2}}$

74. A wheel of radius 30 cm has its centre 36 cm above the ground. It rotates once every 12 seconds. Determine an equation for the height, h, above the ground of a point on the wheel at time t seconds if this point has a minimum height at $t = 0$ seconds.

A. $h = -30\cos\frac{\pi}{12}t + 6$

B. $h = -30\cos\frac{\pi}{6}t + 6$

C. $h = -30\cos\frac{\pi}{12}t + 36$

D. $h = -30\cos\frac{\pi}{6}t + 36$

JUN 2002

75. Convert 210° to radians.

A. 1.83
B. 2.69
C. 3.49
D. 3.67

76. Determine the exact value of $\sec\frac{7\pi}{4}$.

A. $-\sqrt{2}$

B. $-\frac{1}{\sqrt{2}}$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{2}$

77. Determine the period of the function $y = 3\cos 4x$.

A. $\frac{\pi}{2}$

B. $\frac{2\pi}{3}$

C. 6π

D. 8π

78. Determine the range of the function $y = -2\sin 3x + 4$.

A. $-6 \le y \le -2$
B. $-2 \le y \le 2$
C. $0 \le y \le 4$
D. $2 \le y \le 6$

79. Solve: $2\cos x + \sqrt{3} = 0$, $0 \le x < 2\pi$

A. $\frac{5\pi}{6}, \frac{7\pi}{6}$

B. $\frac{4\pi}{3}, \frac{5\pi}{3}$

C. $\frac{2\pi}{3}, \frac{4\pi}{3}$

D. $\frac{7\pi}{6}, \frac{11\pi}{6}$

80. The function $h(t) = 3.9\sin 0.16\pi(t-3) + 6.5$ gives the depth of water, h metres, at any time, t hours, during a certain day. A cruise ship needs at least 8 metres of water to dock safely. Use the graph of the function to estimate the number of hours in the 24 hour interval starting at $t = 0$ during which the cruise ship can dock safely.

A. 3.79
B. 4.68
C. 7.57
D. 9.36

AUG 2002

81. Determine the amplitude of $y = -5\sin\pi(x-3)+4$.

A. -5
B. 3
C. 4
D. 5

82. Convert 135° to radians.

A. 1.18
B. 1.92
C. 2.36
D. 4.71

83. Determine the period of $y = \tan 4x$.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. 2π

D. 4π

84. Determine the exact value of $\sec\frac{11\pi}{6}$.

A. -2

B. 2

C. $-\frac{2}{\sqrt{3}}$

D. $\frac{2}{\sqrt{3}}$

85. Solve: $\sqrt{2}\sin x + 1 = 0$, $0 \le x < 2\pi$

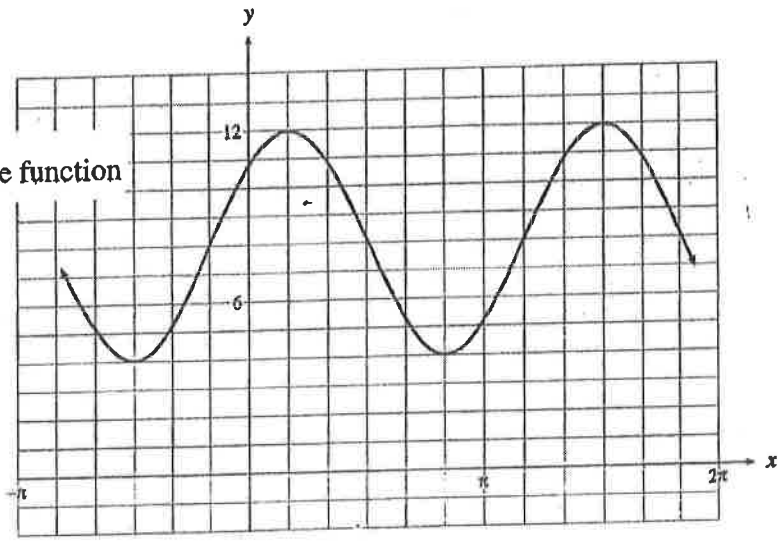
A. $\frac{\pi}{4}, \frac{3\pi}{4}$

B. $\frac{\pi}{4}, \frac{7\pi}{4}$

C. $\frac{3\pi}{4}, \frac{5\pi}{4}$

D. $\frac{5\pi}{4}, \frac{7\pi}{4}$

86. Which equation represents the sine function



A. $y = 4\sin\frac{4}{3}\left(x+\frac{\pi}{6}\right)+8$

B. $y = 4\sin\frac{4}{3}\left(x-\frac{\pi}{6}\right)+8$

C. $y = 4\sin\frac{3}{2}\left(x-\frac{\pi}{6}\right)+8$

D. $y = 4\sin\frac{3}{2}\left(x+\frac{\pi}{6}\right)+8$

87. A wheel rolling along the ground has a radius of 32 cm and rotates once every 8 seconds. At time $t = 0$ seconds, a point P on the outside edge of the wheel is touching the ground. Determine a cosine function that gives the height, h, of point P above the ground at any time, t, where h is in cm and t is in seconds.

A. $h(t) = -32\cos\frac{\pi}{4}t$

B. $h(t) = -32\cos 2\pi t$

C. $h(t) = -32\cos\frac{\pi}{4}t + 32$

D. $h(t) = -32\cos 2\pi t + 32$

JAN 2003

88. Determine the range of the function $y = 4\cos x - 2$.

A. $-4 \le y \le 4$

B. $-2 \le y \le 6$

C. $-6 \le y \le 2$

D. $2 \le y \le 6$

89. Determine the exact value of $\cot\frac{5\pi}{3}$.

A. $\sqrt{3}$

B. $-\sqrt{3}$

C. $\frac{1}{\sqrt{3}}$

D. $-\frac{1}{\sqrt{3}}$

90. Determine the period of the function $f(x) = -\frac{1}{2}\sin\frac{x}{3}$.

A. $\frac{2\pi}{3}$

B. π

C. 4π

D. 6π

91. Solve: $2\sin x + 1 = 0$, $0 \le x < 2\pi$

A. $-\frac{\pi}{6}, -\frac{5\pi}{6}$

B. $\frac{\pi}{6}, \frac{5\pi}{6}$

C. $\frac{7\pi}{6}, \frac{11\pi}{6}$

D. $\frac{4\pi}{3}, \frac{5\pi}{3}$

JUN 2003

92. Convert 120° to radians.

A. $\frac{2\pi}{3}$

B. $\frac{5\pi}{6}$

C. $\frac{3\pi}{2}$

D. $\frac{6\pi}{5}$

93. Determine the amplitude of $y = -2\sin 4\left(x - \frac{\pi}{3}\right) + 3$.

A. -2

B. 2

C. 3

D. 4

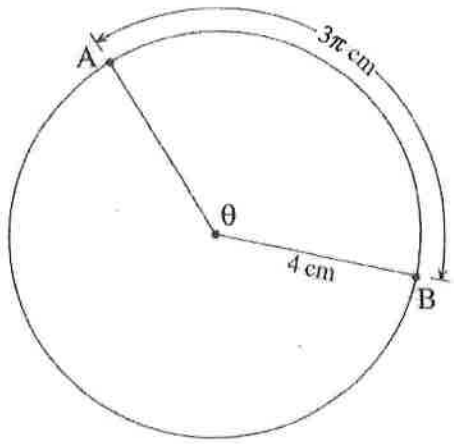
94. A circle has a radius of 4 cm. If the length of arc AB shown on the diagram is 3π cm, determine the measure of the central angle θ in radians.

A. $\frac{3\pi}{4}$

B. $\frac{4}{3\pi}$

C. $\frac{3\pi}{2}$

D. 3π



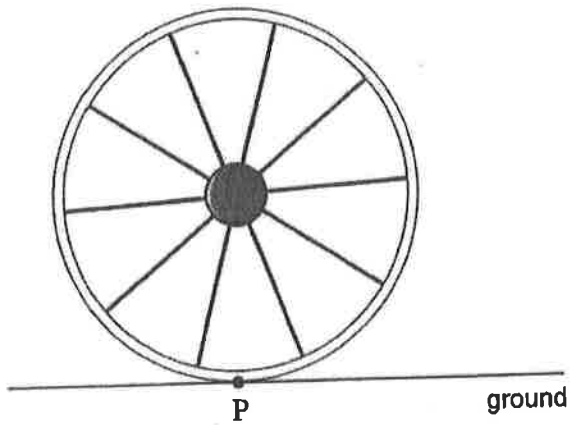
95. A wheel with diameter 10 cm is rolling along the ground. Point P on the edge of the wheel is on the ground as shown in the diagram at time $t = 0$ seconds. Which equation gives the height, h, of point P above the ground at time t seconds, if the wheel rotates once every 12 seconds?

A. $h = -5\cos\frac{\pi}{12}t$

B. $h = -5\cos\frac{\pi}{6}t$

C. $h = -5\cos\frac{\pi}{12}t + 5$

D. $h = -5\cos\frac{\pi}{6}t + 5$



96. The point (p, q) is the point of intersection of the terminal arm of angle θ in standard position and the unit circle centred at $(0, 0)$. Which expression represents $\sec\theta$?

A. q B. p C. $\frac{1}{q}$ D. $\frac{1}{p}$

97. Determine the equations of the asymptotes of the function $y = \tan bx$, where $b > 0$.

A. $x = \frac{n\pi}{b}$, n is an integer

B. $x = \frac{n\pi}{2b}$, n is an integer

C. $x = \frac{\pi}{b} + \frac{n\pi}{b}$, n is an integer

D. $x = \frac{\pi}{2b} + \frac{n\pi}{b}$, n is an integer

JAN 2004

98. Convert $\frac{8\pi}{3}$ radians to degrees.

A. 60°
B. 120°
C. 240°
D. 480°

99. Determine the minimum value of the function $y = -3\sin 2x + 4$.

A. −7
B. −3
C. −1
D. 1

100. Determine the exact value of $\sec\frac{5\pi}{4}$.

A. $-\sqrt{2}$

B. $-\frac{1}{\sqrt{2}}$

C. $\frac{1}{\sqrt{2}}$

D. $\sqrt{2}$

101. The terminal arm of angle θ, in standard position, passes through the point $(-2, 9)$. Determine the value of $\sin\theta$.

A. $\frac{-2}{\sqrt{77}}$

B. $\frac{9}{\sqrt{77}}$

C. $\frac{-2}{\sqrt{85}}$

D. $\frac{9}{\sqrt{85}}$

102. In a seaport, the function $d(t) = 2.6\sin 0.25(t-5) + 3.3$ can be used to approximate the depth of the water, d metres, at time t hours after midnight. Estimate the number of hours in the 24-hour interval starting at $t = 0$ when the depth of the water is at least 3.5 m.

A. 5.31 h
B. 11.95 h
C. 17.26 h
D. 23.90 h

JUN 2004

103. Determine the exact value of $\cos\frac{7\pi}{4}$.

A. $\frac{1}{\sqrt{2}}$

B. $\frac{\sqrt{3}}{2}$

C. $-\frac{\sqrt{3}}{2}$

D. $-\frac{1}{\sqrt{2}}$

104. In a circle with radius 12 cm an arc of length 20 cm subtends a central angle of θ. Determine the measure of θ in radians.

A. 0.60
B. 1.20
C. 1.67
D. 3.33

105. Solve: $7\tan x = -3$, $0 \le x < 2\pi$

A. 2.74, 3.55
B. 2.74, 5.88
C. 0.40, 3.55
D. 0.40, 5.88

106. Give the period of $f(x) = 3\csc x$.

A. $\frac{\pi}{3}$
B. π
C. 2π
D. 3π

107. Let θ be an angle in standard position such that $\tan\theta = \frac{2}{3}$ and $\sin\theta < 0$. Determine the exact value of $\sec\theta$.

A. $-\frac{\sqrt{13}}{2}$

B. $-\frac{\sqrt{13}}{3}$

C. $\frac{\sqrt{13}}{3}$

D. $\frac{\sqrt{13}}{2}$

108. For the function $f(x) = 3\sin bx + d$ where b and d are positive constants, determine an expression for the smallest positive value of x that produces the maximum value of $f(x)$.

A. $\frac{2\pi}{b}$

B. $\frac{\pi}{2b}$

C. $\frac{4\pi}{b}$

D. $\frac{\pi}{4b}$

AUG 2005

109. Determine the amplitude of $y = -2\cos x - 3$.

A. -3
B. -2
C. 2
D. 3

110. Evaluate: $\sec\frac{4\pi}{3}$

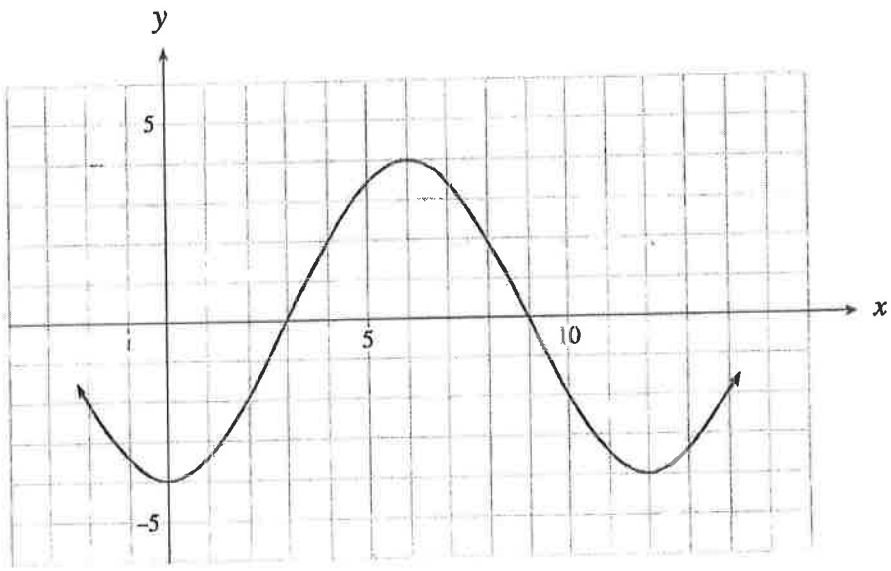
A. -2

B. $-\frac{2}{\sqrt{3}}$

C. $\frac{2}{\sqrt{3}}$

D. 2

111. Given the graph below, determine an equation of this function.



A. $y = -4\cos\frac{\pi}{6}x$

B. $y = 4\cos\frac{\pi}{6}x$

C. $y = -4\cos\frac{\pi}{12}x$

D. $y = 4\cos\frac{\pi}{12}x$

112. If $\frac{\pi}{2} \le \theta \le \frac{3\pi}{2}$ and $\tan\theta = -\frac{4}{3}$, determine the exact value of $\sin\theta$.

A. $-\frac{4}{5}$

B. $-\frac{3}{5}$

C. $\frac{3}{5}$

D. $\frac{4}{5}$

113. Determine the reference angle for $\frac{7\pi}{5}$.

A. $\frac{\pi}{5}$

B. $\frac{2\pi}{5}$

C. $\frac{3\pi}{5}$

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

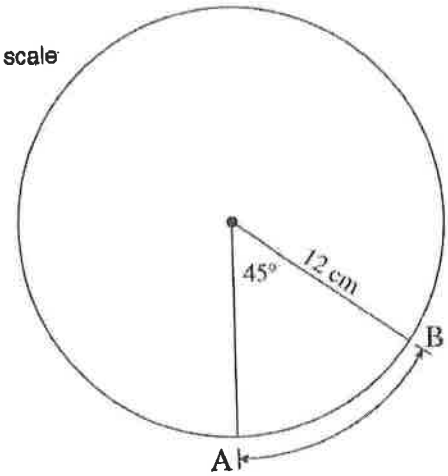
AUG 2006

114. Determine the amplitude of the function $y = -4\cos(x-2)$.

A. -4
B. -2
C. 2
D. 4

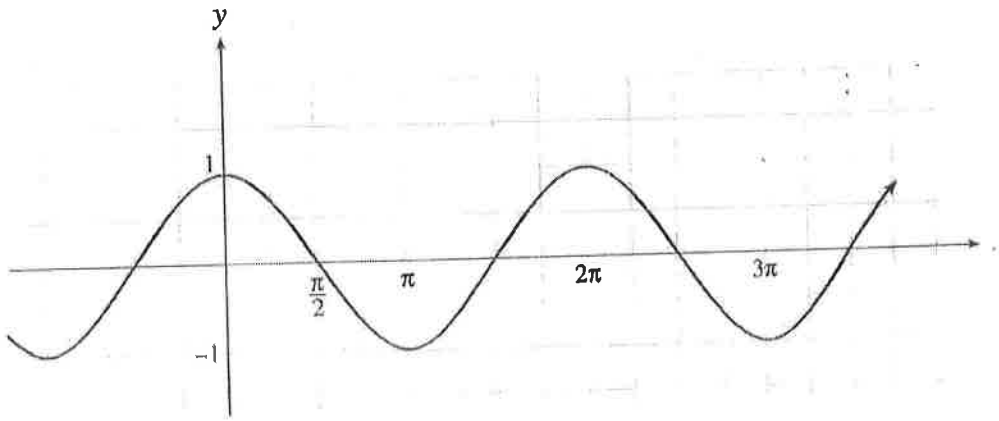
115. A circle has a radius of 12 cm. If the central angle is 45°, as shown in the diagram, determine the length of arc AB.

Diagram not drawn to scale



A. 2π cm
B. 3π cm
C. 4π cm
D. 6π cm

116. Which equation represents the function graphed below?



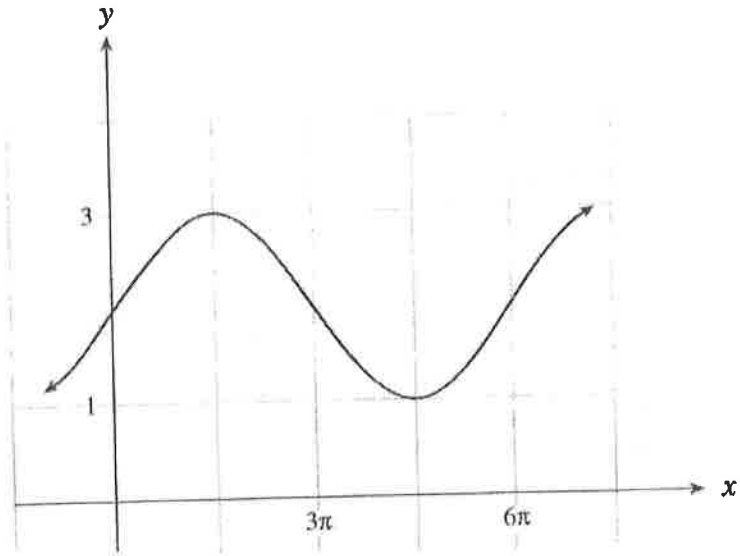
A. $y = \cos\left(x + \frac{\pi}{2}\right)$

B. $y = \sin\left(x - \frac{\pi}{2}\right)$

C. $y = -\cos\left(x - \frac{\pi}{2}\right)$

D. $y = -\sin\left(x - \frac{\pi}{2}\right)$

117. If the graph of the function shown below has the equation $y = a\sin bx + d$, determine the value of b $(b > 0)$.



A. $\frac{1}{3}$

B. 3

C. 2π

D. 6π

118. Let θ be an angle in standard position such that $\cot\theta = -\frac{4}{3}$ and $\sin\theta < 0$.
Determine the exact value of $\sec\theta$.

A. $-\frac{5}{3}$ B. $-\frac{5}{4}$ C. $\frac{5}{4}$ D. $\frac{5}{3}$

119. A wheel rolling along the ground has a diameter of 16 cm and rotates every 12 seconds. At time $t = 0$ s, a point P on the outside edge of the wheel is at its highest point. Determine a cosine function that gives the height, h, of point P above the ground at any time, t, where h is in cm and t is in seconds.

A. $h(t) = -8\cos\frac{\pi}{6}t + 8$

B. $h(t) = 8\cos\frac{\pi}{12}t + 8$

C. $h(t) = 8\cos\frac{\pi}{6}t + 8$

D. $h(t) = -8\cos\frac{\pi}{12}t + 8$

SAMPLE 2008

120. Evaluate: $\tan\frac{5\pi}{3}$

A. $-\frac{1}{\sqrt{3}}$

B. $\frac{1}{\sqrt{3}}$

C. $-\sqrt{3}$

D. $\sqrt{3}$

121. Determine the period of the function $y = 3\cos\frac{\pi}{4}x$.

A. $\frac{\pi}{4}$

B. $\frac{\pi}{2}$

C. 4

D. 8

122. The terminal arm of angle θ in standard position intersects the unit circle at the point (m, n).
Which expression represents $\cot\theta$?

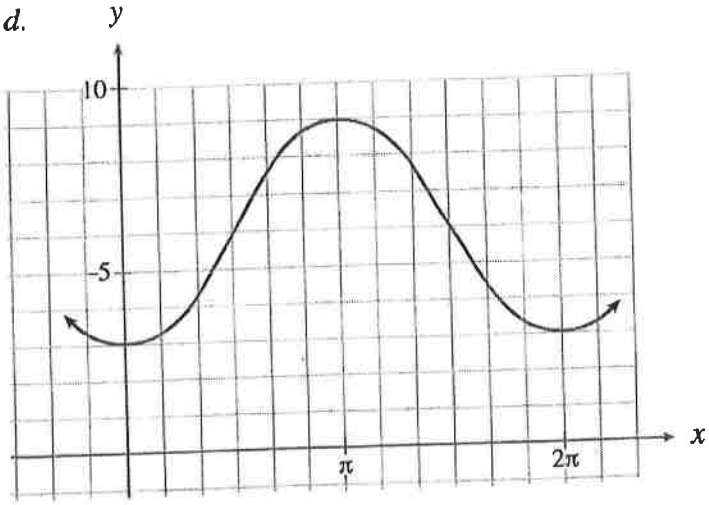
A. m

B. n

C. $\frac{n}{m}$

D. $\frac{m}{n}$

123. If the graph of the function shown below has the equation $y = a\cos b(x-c)+d$, determine the value of d.



A. 3
B. 5
C. 6
D. 9

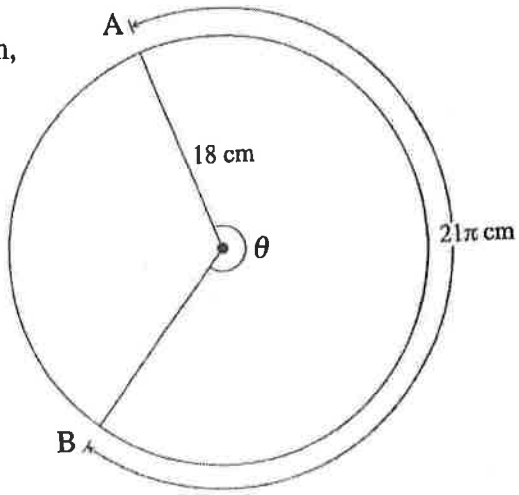
124. Determine an equation of an asymptote of $y = \sec 3x$.

A. $x = \frac{\pi}{6}$ B. $x = \frac{\pi}{3}$ C. $x = \frac{2\pi}{3}$ D. $x = \pi$

125. The height above the ground, h metres, of a person on a Ferris wheel at time t seconds, is given by the formula $h(t) = -20\cos\frac{2\pi}{40}t + 23$, where $t \geq 0$. Determine the earliest time at which the person will be 15 m above the ground.

A. 7.38 s
B. 12.62 s
C. 32.62 s
D. 37.14 s

126. A circle has a radius of 18 cm. If the length of arc AB is 21π cm, determine the measure of the central angle θ in degrees.



A. 120°
B. 150°
C. 210°
D. 240°

127. A minimum value of a sinusoidal function is at $\left(\frac{\pi}{4}, 3\right)$. The nearest maximum value to the right of this point is at $\left(\frac{7\pi}{12}, 7\right)$. Determine an equation of this function.

JAN 2008

128. Determine the amplitude of the function $y = -4\cos(x-2)$.

A. -4
B. -2
C. 2
D. 4

129. The terminal arm of angle θ in standard position intersects the unit circle at the point (m, n). Which expression represents $\tan\theta$?

A. $\frac{n}{m}$

B. $\frac{m}{n}$

C. $\frac{1}{m}$

D. $\frac{1}{n}$

130. Determine the exact value of $\csc\frac{7\pi}{4}$.

A. $-\sqrt{2}$

B. $\sqrt{2}$

C. $-\frac{1}{\sqrt{2}}$

D. $\frac{1}{\sqrt{2}}$

131. In a circle, an arc of length 30 cm contains a central angle of $120°$. Determine the radius of this circle.

A. $\frac{36}{\pi}$ cm

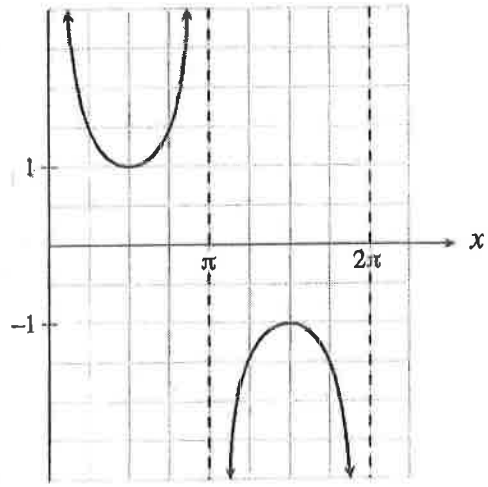
B. $\frac{45}{\pi}$ cm

C. 20π cm

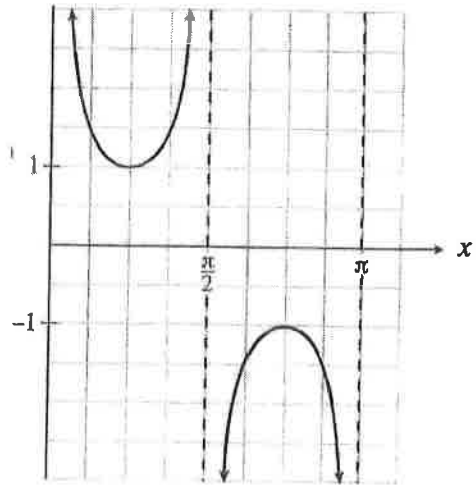
D. 45π cm

132. Which of the following is the graph of one period of the function $y = \sec 2x$?

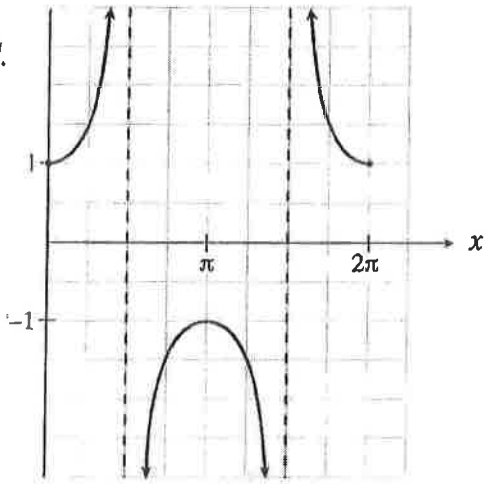
A.



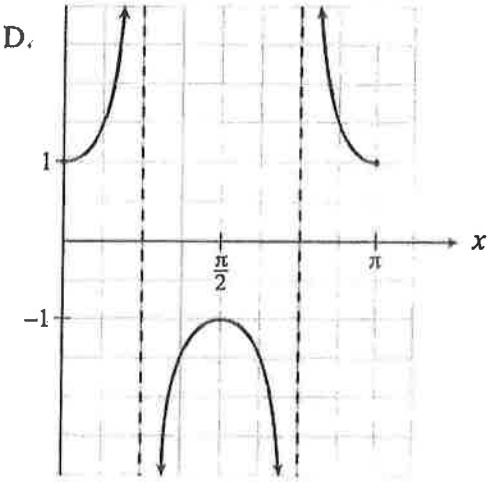
B.



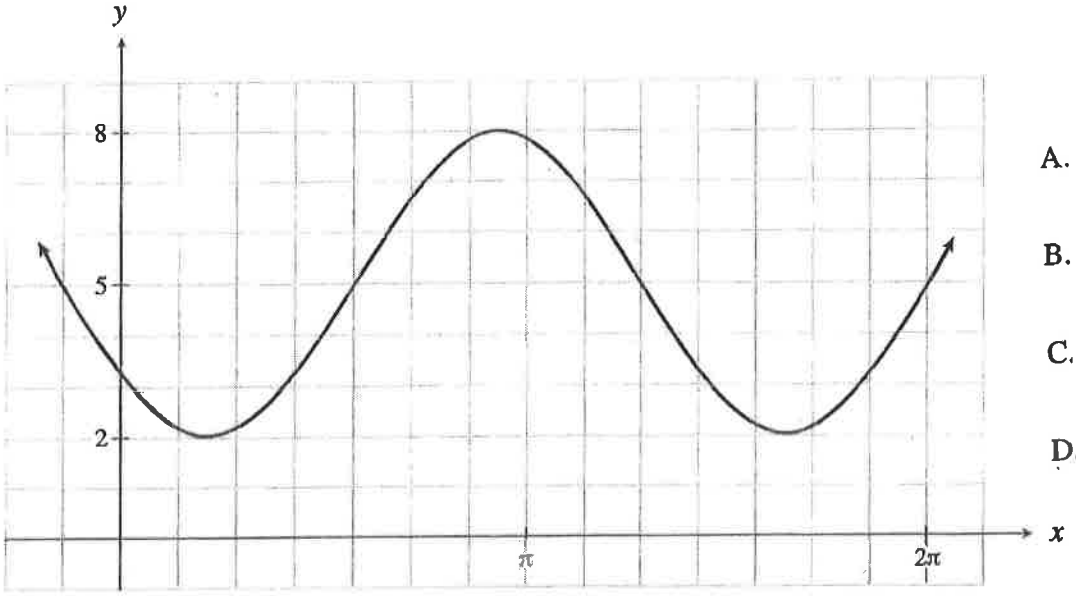
C.



D.



133. Given the graph of the function $y = a\sin b(x - c) + d$ below, determine the value of b.



A. $\frac{10\pi}{7}$

B. $\frac{7}{5}$

C. $\frac{5\pi}{7}$

D. $\frac{14}{5}$

134. The point $(5, -6)$ is on the terminal arm of standard position angle θ. Determine the smallest positive measure of θ in radians.

A. 0.69
B. 0.88
C. 5.41
D. 5.59

135. At a seaport, the water has a maximum depth of 16 m at midnight. After this maximum depth, the first minimum depth of 4 m occurs 5.8 h later. Assume that the relation between the depth in metres and the time in hours is a sinusoidal function. How many hours after midnight will the water reach a depth of 8 m for the first time?

A. 1.76 h
B. 2.27 h
C. 3.53 h
D. 3.67 h

ADDITIONAL QUESTIONS

136 What is the reference angle of $\frac{16\pi}{3}$ radians?

A. $\frac{\pi}{6}$ B. $\frac{\pi}{3}$ C. $\frac{2\pi}{3}$ D. $\frac{4\pi}{3}$

137 Determine the smallest positive angle θ, in radians, such that $\csc\theta = -\sqrt{2}$.

A. $\frac{\pi}{4}$ B. $\frac{3\pi}{4}$ C. $\frac{5\pi}{4}$ D. $\frac{7\pi}{4}$

138 A circle has a radius of 12 cm. Determine the area of a sector (pie-shaped region) of the circle which has an angle of 2.1 radians. (accurate to 1 decimal place)

A. 25.2 cm^2 B. 151.2 cm^2 C. 215.4 cm^2 D. 302.4 cm^2

139 The smallest positive zero of the function $y = \cos k\left(x + \frac{\pi}{8}\right)$ occurs at $x = \frac{\pi}{2}$. Find the value of k if $k > 0$.

A. $\frac{\pi}{2}$ B. $\frac{3\pi}{8}$ C. $\frac{4}{5}$ D. $\frac{5}{4}$

140. A cosine curve has a maximum point at $(3, 20)$ and the nearest minimum point to the right of this point is $(8, 4)$. Which of the following is an equation for this curve?

A. $y = 8\cos\frac{2\pi}{5}(x+3)+12$

B. $y = 8\cos\frac{2\pi}{5}(x-3)+12$

C. $y = 8\cos\frac{\pi}{5}(x+3)+12$

D. $y = 8\cos\frac{\pi}{5}(x-3)+12$

141. If the point $(1, 2)$ lies on the terminal arm of an angle θ in standard position, determine the value of $\cos(\pi + \theta)$.

A. $\frac{-2}{\sqrt{5}}$ B. $\frac{-1}{\sqrt{5}}$ C. $\frac{1}{\sqrt{5}}$ D. $\frac{2}{\sqrt{5}}$

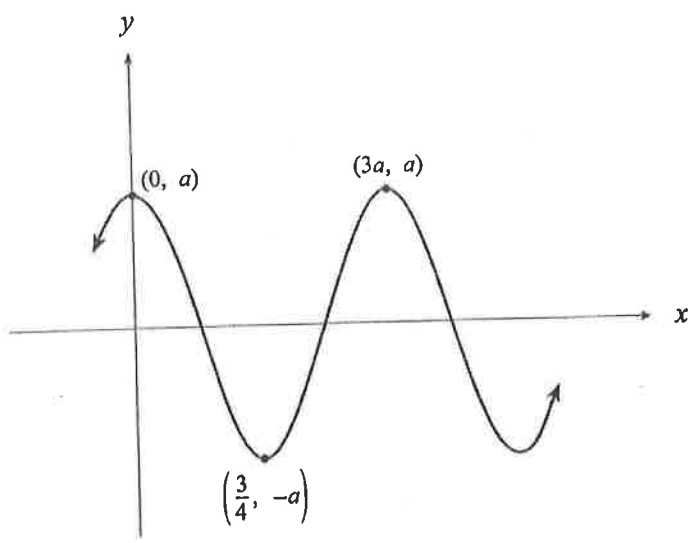
142. Given the graph of $y = a\cos kx$ as shown, determine a.

A. $\frac{1}{2}$

B. 1

C. $\frac{3}{2}$

D. 3



143. If $\sum_{k=1}^{\infty}(\sin x)^{k-1} = 6$, determine x to the nearest degree.

A. 36° B. 46° C. 56° D. 66°

2009 SAMPLE QUESTIONS

144. Convert $\frac{5\pi}{2}$ radians to degrees.

A. 90° B. 180° C. 270° D. 450°

145. A circle has a radius of 20 cm. Determine the length of the arc subtended by a central angle of 135°.

A. $\frac{3\pi}{4}$ cm B. 5π cm C. 15π cm D. $\frac{80}{3\pi}$ cm

146. The terminal arm of angle θ in standard position passes through the point $(-\sqrt{3}, -1)$. Determine the length of arc AB, as shown below.

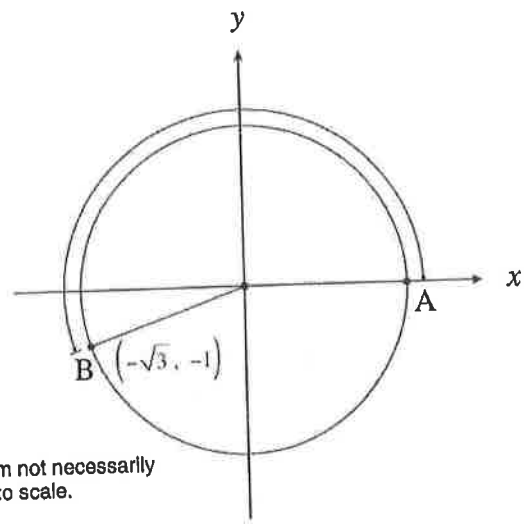


Diagram not necessarily drawn to scale.

A. $\frac{5\pi}{6}$ B. $\frac{7\pi}{6}$ C. $\frac{7\pi}{3}$ D. $\frac{8\pi}{3}$

147. Evaluate: $\sec\frac{4\pi}{3}$

A. -2 B. $-\frac{2}{\sqrt{3}}$ C. $\frac{2}{\sqrt{3}}$ D. 2

148. Determine the exact value of $\tan\frac{8\pi}{3}$.

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

149. Determine the exact value of $\sin\left(-\frac{3\pi}{4}\right)$.

A. $-\sqrt{2}$ B. $-\frac{1}{\sqrt{2}}$ C. $\frac{1}{\sqrt{2}}$ D. $\sqrt{2}$

150. Solve: $\csc x = 2,\ 0 \le x < 2\pi$

A. $x = \frac{\pi}{6}, \frac{5\pi}{6}$ B. $x = \frac{\pi}{6}, \frac{11\pi}{6}$ C. $x = \frac{\pi}{3}, \frac{2\pi}{3}$ D. $x = \frac{\pi}{3}, \frac{4\pi}{3}$

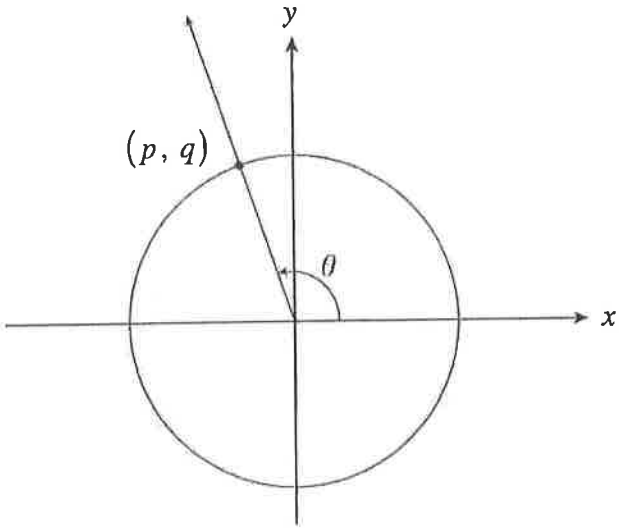
151. The point $(p,\ q)$ is the point of intersection of the terminal arm of angle θ in standard position and the unit circle as shown in the diagram. Which expression represents $\tan\theta$?

A. p

B. q

C. $\frac{p}{q}$

D. $\frac{q}{p}$



152. The terminal arm of angle θ in standard position passes through the point $(-2,\ 5)$. Determine the value of $\sec\theta$.

A. $-\frac{\sqrt{21}}{2}$ B. $\frac{\sqrt{21}}{5}$ C. $-\frac{\sqrt{29}}{2}$ D. $\frac{\sqrt{29}}{5}$

153. Point M $(-a,\ b)$ is in quadrant II and lies on the terminal arm of angle θ in standard position. Point N is the point of intersection of the terminal arm of angle θ and the unit circle centred at $(0,\ 0)$. Determine the x-coordinate of point N in terms of a and b.

A. $\frac{-a}{\sqrt{a^2+b^2}}$ B. $\frac{-b}{\sqrt{a^2+b^2}}$ C. $\frac{a}{\sqrt{a^2+b^2}}$ D. $\frac{b}{\sqrt{a^2+b^2}}$

154. Determine the amplitude of $y = -3\cos 4x + 2$.

A. -4 B. -3 C. 3 D. 4

155. Determine the period of $y = \sin \frac{2\pi}{3}(x-6)$.

A. 3 B. 6 C. $\frac{2\pi}{3}$ D. $\frac{4\pi}{3}$

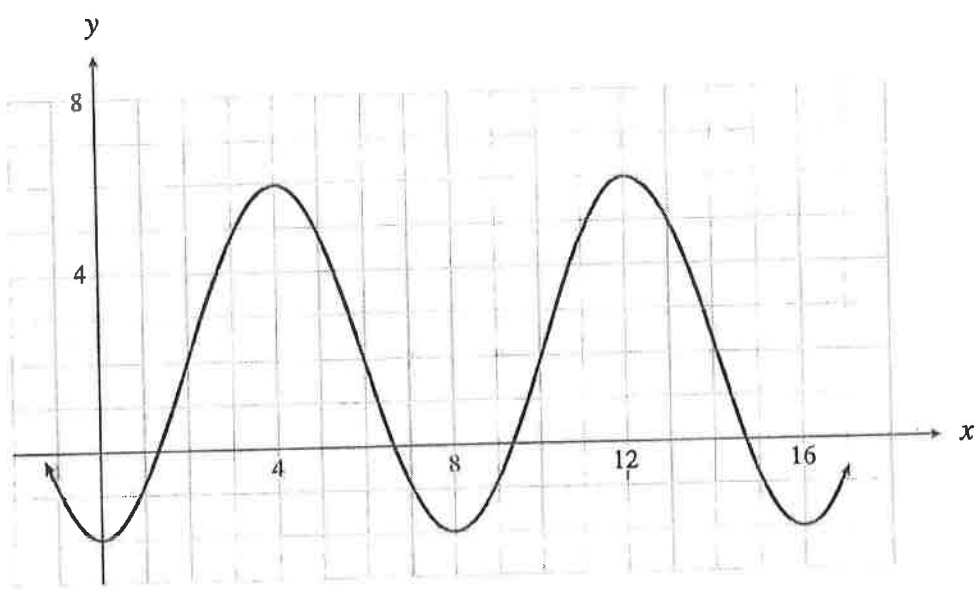
156. Determine the range of the function $y = 6\cos \frac{1}{2}(x-3)+4$.

A. $-6 \le y \le 6$ B. $1 \le y \le 7$ C. $-4 \le y \le 4$ D. $-2 \le y \le 10$

157. Which of the following lines is an asymptote for the graph of $y = \csc 2x$?

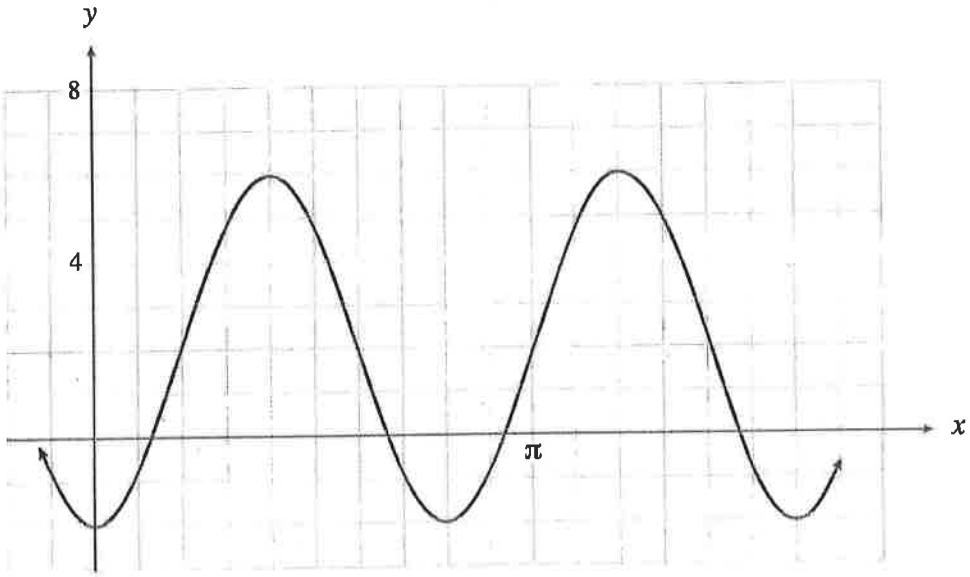
A. $x = 1$ B. $x = \frac{\pi}{4}$ C. $x = \frac{\pi}{2}$ D. $x = \frac{3\pi}{4}$

158. If the graph of the function shown below has the equation $y = a\sin b(x-c)+d$, determine the value of b. $(b > 0)$



A. 4 B. 8 C. $\frac{\pi}{4}$ D. $\frac{\pi}{8}$

159. If the graph of the function shown below has the equation $y = a\sin b(x-c)+d$, determine the value of b. $(b > 0)$



A. $\frac{5}{4}$ B. $\frac{5}{2}$ C. $\frac{2\pi}{5}$ D. $\frac{4\pi}{5}$

160. State the phase shift of the function $y = -\cos\left(4x - \frac{\pi}{2}\right)$.

A. $\frac{\pi}{8}$ to the right

B. $\frac{\pi}{8}$ to the left

C. $\frac{\pi}{2}$ to the right

D. $\frac{\pi}{2}$ to the left

161. Determine the domain of $f(x) = \tan 2x$.

A. $x =$ all real numbers

B. $x =$ all real numbers, $x \neq \frac{\pi}{4} + \frac{n\pi}{2}$, n is an integer

C. $x =$ all real numbers, $x \neq \frac{\pi}{2} + n\pi$, n is an integer

D. $x =$ all real numbers, $x \neq \pi + 2n\pi$, n is an integer

162. At a seaport, the depth of the water, d, in metres, at time t hours, during a certain day is given by:

$$d = 3.4\sin 2\pi\frac{(t-7.00)}{10.6} + 4.8$$

On that day, determine the depth of the water at 6:30 p.m.

A. 3.43 m B. 3.81 m C. 4.80 m D. 6.53 m

163. A wheel with radius 20 cm has its centre 30 cm above the ground. It rotates once every 15 seconds. Determine an equation for the height, h, above the ground of a point on the wheel at time, t seconds if this point has a maximum height at $t = 2$ seconds.

A. $h = 20\cos\frac{2\pi}{15}(t+2)+30$

B. $h = 20\cos\frac{2\pi}{15}(t-2)+30$

C. $h = 30\cos\frac{2\pi}{15}(t+2)+20$

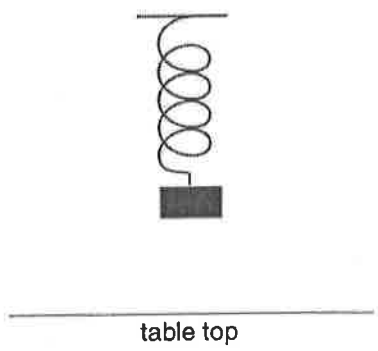
D. $h = 30\cos\frac{2\pi}{15}(t-2)+20$

164. A Ferris wheel with a diameter of 60 m rotates once every 48 seconds. At time $t = 0$, a rider is at his lowest height which is 2 m above the ground.

a) Determine a sinusoidal equation that gives the height, h, of the rider above the ground as a function of the elapsed time, t, where h is in metres and t is seconds.

b) Determine the time t when the rider will be 38 m above the ground for the first time after $t = 0$.

165. A mass is supported by a spring so that it rests 50 cm above a table top, as shown in the diagram below. The mass is pulled down to a height of 20 cm above the tabletop and released at time $t = 0$. It takes 0.8 seconds for the mass to reach a maximum height of 80 cm above the tabletop. As the mass moves up and down, its height h, in cm, above the tabletop, is approximated by a sinusoidal function of the elapsed time t, in seconds, for a short period of time.



Determine an equation for a sinusoidal function that gives h as a function of t.

TRIGONOMETRY I

1	C
2	A
3	D
4	D
5	A
6	B
7	C
8	B
9	C
10	B
11	B
12	C
13	C
14	A
15	D
16	C
17	C
18	C
19	B
20	B
21	B
22	C
23	D
24	C
25	A
26	C
27	D
28	B
29	D
30	B
31	B
32	D
33	A
34	B
35	C
36	B
37	C
38	D
39	A
40	C
41	B
42	C
43	B
44	D
45	B
46	C
47	A
48	C
49	B
50	D
51	B
52	D
53	B
54	B
55	D
56	A
57	C
58	A
59	A
60	B
61	B
62	B
63	D
64	C
65	B
66	B
67	C
68	A
69	C
70	D
71	A
72	C
73	A
74	D
75	D
76	D
77	A
78	D
79	A
80	D
81	D
82	C
83	A
84	D
85	D
86	D
87	C
88	C
89	D
90	D
91	C
92	A
93	B
94	A
95	D
96	D
97	D
98	D
99	D
100	A
101	D
102	B
103	A
104	C
105	B
106	C
107	B
108	B
109	C
110	A
111	A
112	D
113	B
114	D
115	B
116	D
117	A
118	C
119	C
120	C
121	D
122	D
123	C
124	A
125	A
126	C
127	$y=-2\cos 3\left(x-\frac{\pi}{4}\right)+5$
128	D
129	A
130	A
131	B
132	D
133	B
134	C
135	C
136	B
137	C
138	B
139	C
140	D
141	B
142	A
143	C
144	D
145	C
146	C
147	A
148	A
149	B
150	A
151	D
152	C
153	A
154	C
155	A
156	D
157	C
158	C
159	B
160	A
161	B
162	D
163	B
164	a) $h=-30\cos\left(\frac{\pi}{24}t\right)+32$
	b) 13.54 s
165	$h=-30\cos\left(\frac{2\pi}{1.6}t\right)+50$