Trigonometry Homework Booklet

1. Convert 5.3 radians to degrees.

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

2. 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

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

4. The point (*m*, *n*) is the intersection 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. $\frac{n}{m}$

5. 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. $x = \pi$

6. Simplify: $\frac{\sin 2\theta}{\sin\theta}$

   A. 2 B. $\sin\theta$ C. $\cos\theta$ D. $2\cos\theta$

7. Which expression is equivalent to $\frac{\cos x + \cot x}{\sin x + 1}$?

   A. $\sec x$ B. $\csc x$ C. $\cot x$ D. $\tan x$

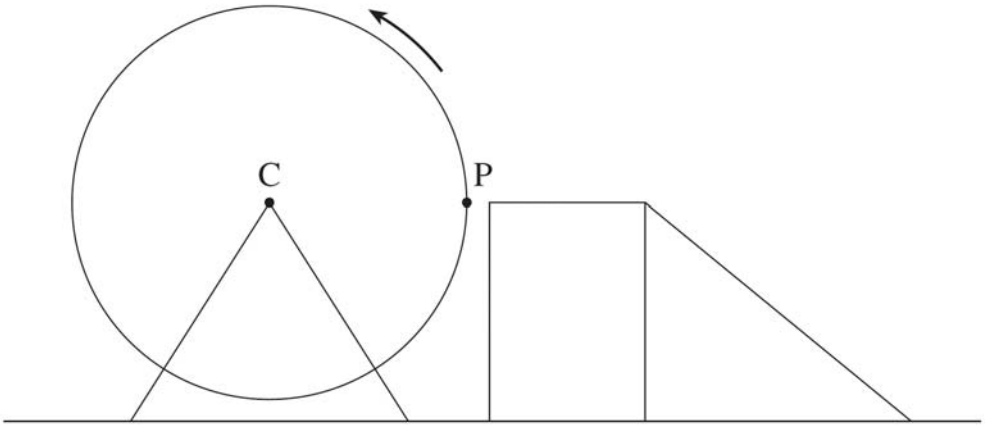
8. Which expression is equivalent to $\sin\left(x + \frac{\pi}{3}\right) + \sin\left(x - \frac{\pi}{3}\right)$?

   A. $\frac{\sqrt{3}}{4}\sin x$ B. $\sin x$ C. $\sqrt{3}\sin x$ D. $2\sin x$

9. Solve: $\sin 3x + \tan x = 3,\ 0 \le x \le 2\pi$

   A. 1.31, 4.34 B. 2.44, 3.85 C. 1.31, 1.57, 4.34, 4.71 D. 0, 2.44, 3.14, 3.85

10. 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. 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 is $t = 0$ seconds, determine a sine function that gives the passenger's height, h, in metres, above the ground as a function of t.



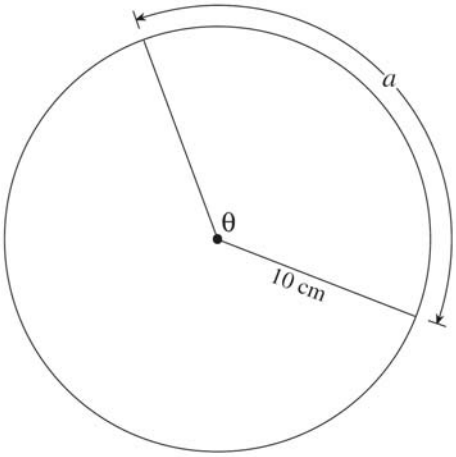
A. $h(t) = 18\sin\frac{\pi}{16}t + 20$ B. $h(t) = 18\sin\frac{\pi}{32}t + 20$

C. $h(t) = 20\sin\frac{\pi}{16}t + 18$ D. $h(t) = 20\sin\frac{\pi}{32}t + 18$

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

A. 1 radian B. $\frac{\pi}{2}$ radians C. π radians D. 2π radians

12. 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

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

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

14. Solve: $\cos x = 2x,\ 0 \le x < 2\pi$

A. 0.45 B. 0.58 C. 0.90 D. no solution

15. The expression $\cos 3x \cos 2x - \sin 3x \sin 2x$ is equal to

A. $\sin x$ B. $\sin 5x$ C. $\cos x$ D. $\cos 5x$

16. Solve: $2\cos^2 x - 1 = 0,\ 0 \le x < 2\pi$

A. $\frac{\pi}{4}, \frac{7\pi}{4}$ B. $\frac{\pi}{3}, \frac{5\pi}{3}$ C. $\frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$ D. $\frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

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

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

18. Simplify: $\frac{\cos\theta}{\cot\theta} + \frac{1}{\csc\theta}$

A. $\csc\theta$ B. $2\sin\theta$ C. $2\cot\theta$ D. $\sin\theta + \cos\theta$

19. The terminal arm of angle θ in standard position passes through the 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. $\frac{m}{\sqrt{m^2 + n^2}}$

20. A wheel of radius 30 cm has its centre 36 cm above the ground. It rotates once every 12 seconds. Determine the 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. $h(t) = -30\cos\frac{\pi}{12}t + 6$ B. $h(t) = 30\cos\frac{\pi}{6}t + 6$

C. $h(t) = -30\cos\frac{\pi}{12}t + 36$ D. $h(t) = -30\cos\frac{\pi}{6}t + 36$

21. Convert 210^0 to radians.

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

22. Determine an expression equivalent to $\sec\theta \cot\theta \sin\theta$.

A. 1 B. $\cot\theta$ C. $\csc\theta$ D. $\tan\theta$

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

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

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

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

25. 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. $2 \le y \le 6$

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

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

27. Solve: $\sin 2x + \cos 3x = 1.5, \quad 0 \le x < 2\pi$.

A. 3.84, 4.37 B. 4.97, 5.12 C. 5.07, 5.58 D. 1.20, 1.90, 3.76, 5.64

28. Simplify: $\sin(2x + \pi)$

A. $\sin 2x$ B. $\cos 2x$ C. $-\sin 2x$ D. $-\cos 2x$

29. The two smallest positive solutions of $\sin 3x = 0.4$ are $x = 0.14$ and $x = 0.91$. Determine the general solution of $\sin 3x = 0.4$.

A. $x = 0.14 + 2n\pi, \quad x = 0.91 + 2n\pi, \ (n \text{ is an integer})$

B. $x = 0.14 + 6n\pi, \quad x = 0.91 + 6n\pi, \ (n \text{ is an integer})$

C. $x = 0.14 + \frac{n\pi}{3}, \quad x = 0.91 + \frac{n\pi}{3}, \ (n \text{ is an integer})$

D. $x = 0.14 + \frac{2n\pi}{3}, \quad x = 0.91 + \frac{2n\pi}{3}, \ (n \text{ is an integer})$

30. 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

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

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

32. Convert 135^0 to radians.

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

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

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

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

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

35. Simplify: $\frac{\csc^2 x - 1}{\csc^2 x}$

A. $\cos^2 x$ B. $\sin^2 x$ C. $-\cos^2 x$ D. $-\sin^2 x$

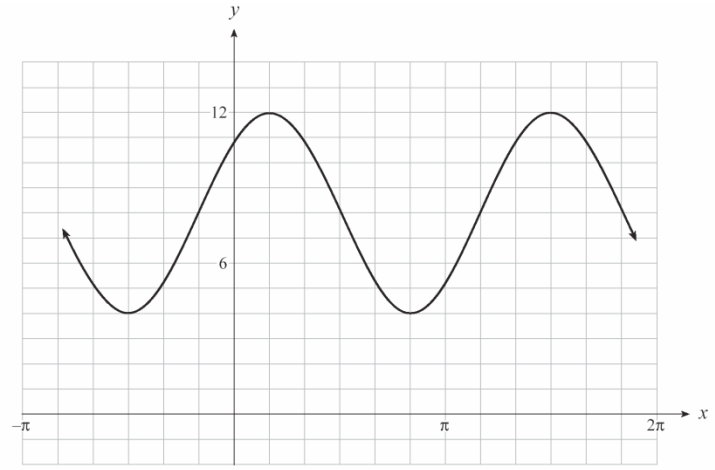
36. Solve: $\sqrt{2}\sin x + 1 = 0, \quad 0 \le x < 2\pi$

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

37. Solve: $3\cos 2x = -x, \quad 0 \le x < 2\pi$

A. 0.67 B. 0.52, 1.57 C. 0.67, 3.07 D. 0.95, 1.99

38. Which equation represents the sine function graphed below?



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

39. A wheel rolling along the ground has a radius of 32 cm and rotates once every 8 seconds. At time $t = 0$, 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. $h(t) = -32\cos 2\pi t + 32$

40. Determine the number of solutions for $(a\sin x + a)(b\cos x - c) = 0$ for $0 \le x < 2\pi$, if $1 < a < b < c$.

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

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

A. 90^0 B. 180^0 C. 270^0 D. 450^0

42. 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. $2 \le y \le 6$

43. Solve: $\sin 2x - \cos x = 1,\ 0 \le x < 2\pi$

A. 0, 5.07 B. 3.14, 4.32 C. 3.14, 4.36 D. 0.42, 1.89, 2.95, 4.21

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

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

45. 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

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

47. Determine an expression equivalent to $\frac{\tan\theta\csc^2\theta}{\sec^2\theta}$.

A. $\tan\theta$ B. $\cot\theta$ C. $\tan^2\theta$ D. $\tan^3\theta$

48. Simplify: $\cos(\pi - 2x)$

A. $-\cos 2x$ B. $-\sin 2x$ C. $\cos 2x$ D. $\sin 2x$

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

50. Determine a cosine equation that has the following general solution:

$$\frac{\pi}{2}+n\pi,\ \frac{\pi}{6}+2n\pi,\ \frac{11\pi}{6}+2n\pi$$

A. $\cos x\left(2\cos x+\sqrt{2}\right)=0$ B. $\cos x\left(2\cos x+\sqrt{3}\right)=0$

C. $\cos x\left(2\cos x-\sqrt{2}\right)=0$ D. $\cos x\left(2\cos x-\sqrt{3}\right)=0$

51. Give the exact value of $\cos\frac{11\pi}{6}$.

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

52. Simplify: $\frac{2\sin\theta}{\sin 2\theta}$.

A. 1 B. $\cos\theta$ C. $\csc\theta$ D. $\sec\theta$

53. An arc of length 5 cm subtends an angle of 30^0 at the centre of a circle with radius *r*. Determine the value of *r*.

A. 4.77 B. 6.00 C. 9.55 D. 10.00

54. Determine the period of $y = \tan\pi x$.

A. 1 B. 2 C. $\frac{\pi}{2}$ D. π

55. Solve: $3\sin x = x + 1,\ 0 \le x < 2\pi$

A. 0.25 B. 1.87, 2.87 C. 0.54, 1.54 D. 0.54, 1.87

56. Simplify: $\sin\left(\frac{3\pi}{2} + x\right)$

A. $\sin x$ B. $\cos x$ C. $-\sin x$ D. $-\cos x$

57. Solve: $\sin^2 x = \sin x \cos x,\ 0 \le x < 2\pi$

A. $x = 0, \frac{\pi}{4}$ B. $x = \frac{\pi}{4}, \frac{7\pi}{4}$ C. $x = 0, \frac{3\pi}{4}, \pi, \frac{7\pi}{4}$ D. $x = 0, \frac{\pi}{4}, \pi, \frac{5\pi}{4}$

58. 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. $\frac{\sqrt{29}}{5}$

59. Determine the range of the function $y = b\cos ax - 2b$, where $a > 0,\ b > 0$.

A. $b \le y \le 3b$ B. $-3b \le y \le -b$ C. $b - a \le y \le b + a$ D. $2b - a \le y \le 2b + a$

60. Determine the general solution for: $\sin 2x = -\frac{1}{2}$

A. $\frac{7\pi}{12} + 2n\pi,\ \frac{11\pi}{12} + 2n\pi$ (n is any integer)

B. $\frac{7\pi}{12} + n\pi,\ \frac{11\pi}{12} + n\pi$ (n is any integer)

C. $\frac{13\pi}{12} + 2n\pi,\ \frac{21\pi}{12} + 2n\pi$ (n is any integer)

D. $\frac{13\pi}{12} + n\pi,\ \frac{21\pi}{12} + n\pi$ (n is any integer)

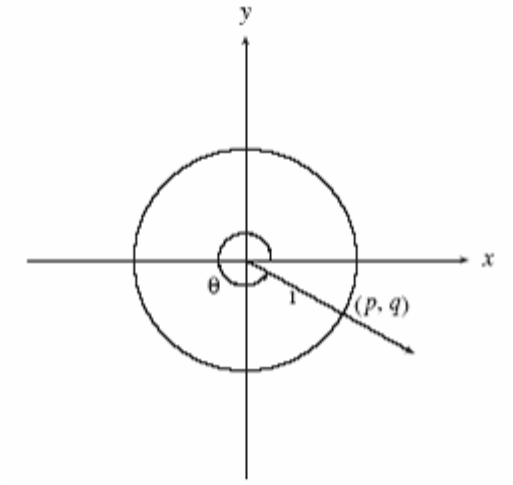
61. Convert $150°$ to radians

A. $\frac{2\pi}{3}$ *B.* $\frac{3\pi}{2}$ *C.* $\frac{5\pi}{6}$ *D.* $\frac{6\pi}{5}$

62. Solve $\tan x + \sin x = 1\ (0 \le x < 2\pi)$

A. 0.49, 4.22 B. 2.06, 5.80 C. 0.49, 1.57, 4.22, 4.71 D. 1.57, 2.06, 4.71, 5.80

63. The diagram below shows the unit circle, determine $\cos\theta$



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

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

A. 5 B. 10 C. $\frac{\pi}{5}$ D. $\frac{\pi}{10}$

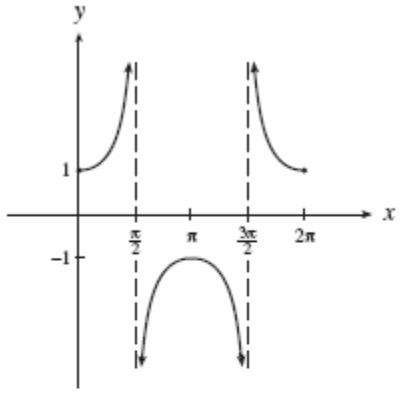
65. Which expression is equivalent to $\frac{\cos 8x + 1}{2}$

A. $\cos^2 4x$ *B.* $\sin^2 4x$ *C.* $\cos^2 16x$ *D.* $\sin^2 16x$

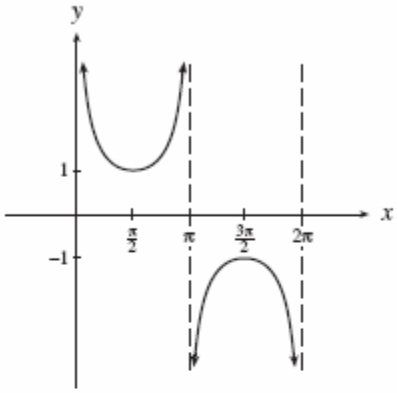
66.

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

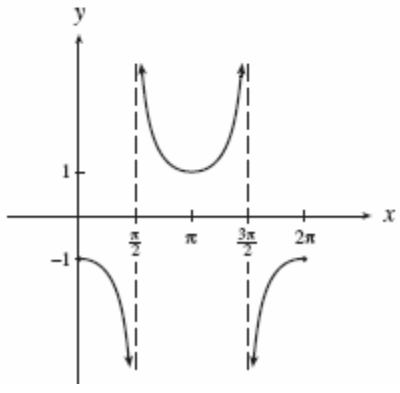
A.



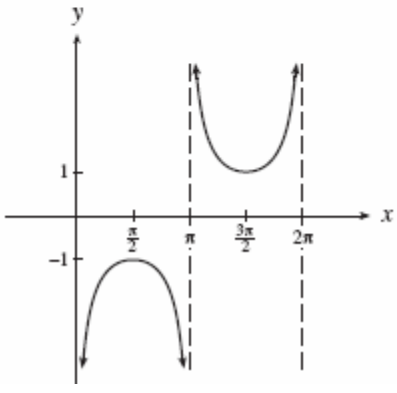
B.



C.



D.



67. Solve: $\sqrt{3}+2\sin x=0 \qquad (0\le x<2\pi)$

$A.\frac{\pi}{3},\frac{2\pi}{3} \qquad B.\frac{4\pi}{3},\frac{5\pi}{3} \qquad C.\frac{\pi}{6},\frac{5\pi}{6} \qquad D.\frac{7\pi}{6},\frac{11\pi}{6}$

68. 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

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

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

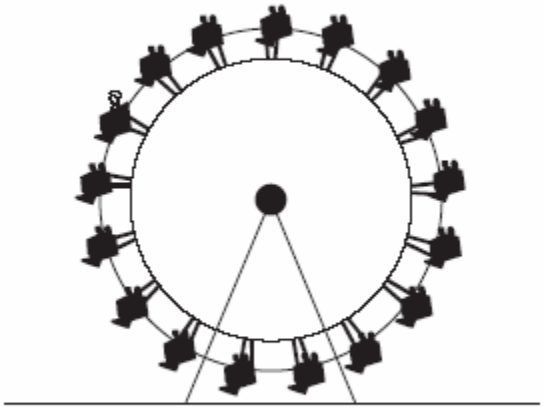
69. Determine the general solution to $3\sin 5x=1$

$A.x=0.07+\frac{2n\pi}{5}, x=0.56+\frac{2n\pi}{5} \qquad B.x=0.07+\frac{2n\pi}{5}, x=5.94+\frac{2n\pi}{5}$

$C.x=0.07+2n\pi, x=0.56+2n\pi \qquad D.x=0.07+2n\pi, x=5.94+2n\pi$

70.

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

Written Questions:

1. Solve $2\cos^2 x + \cos x - 1 = 0$ algebraically over the set of real numbers.
   (Give the general solution using exact values)

2. Prove: $\dfrac{\sin 2x}{1+\cos 2x} = \dfrac{\sec^2 x - 1}{\tan x}$

3. Prove the identity: $\sin 2x\left(\tan x + \cot x\right) = 2$

4. Prove: $\dfrac{2\cos x + 2\cos^2 x}{\sin 2x} = \dfrac{\sin x}{1-\cos x}$

5. Solve the following equation algebraically $3\cos^2 x + \cos x - 2 = 0, \quad 0 \le x \le 2\pi$

6. Prove the identity: $\left(\csc\theta - \sin\theta\right)\tan\theta = \dfrac{\sin 2\theta}{2\sin\theta}$

7. A Ferris wheel has a radius of 25 m and its centre is 27 m above the ground. It rotates once every 40 seconds. Sandy gets on the Ferris wheel at its lowest point and then the wheel begins to rotate.

   a) Determine a sinusoidal equation that gives Sandy's height, *h*, above the ground as a function of the elapsed time, *t*, where *h* is in metres and *t* is in seconds.

   b) Determine the first time, *t* (in seconds), when Sandy will be 35 m above the ground.

8. Prove the identity: $\dfrac{\sin x}{1-\sin x} - \dfrac{\sin x}{1+\sin x} = 2\tan^2 x$

9. Prove the identity: $\dfrac{\cot\theta}{\sin\theta - \csc\theta} = -\sec\theta$

Key

1. D	2. C	3. B	4. B	5. C	6. D	7. C
8. B	9. A	10. A	11. C	12. D	13. A	14. A
15. D	16. C	17. C	18. B	19. A	20. D	21. D
22. A	23. D	24. A	25. D	26. A	27. A	28. C
29. D	30. D	31. D	32. C	33. A	34. D	35. A
36. D	37. D	38. D	39. C	40. A	41. D	42. C
43. C	44. D	45. D	46. C	47. B	48. A	49. B
50. D	51. D	52. D	53. C	54. A	55. D	56. D
57. D	58. C	59. B	60. B	61. C	62. A	63. A
64. A	65. A	66. A	67. B	68. B	69. A	70. B

1.

$2\cos^2 x + \cos x - 1 = 0$

$\cos^2 x + \cos x - 2 = 0$

$(\cos x - 1)(\cos x + 2) = 0$

$\left(\cos x - \frac{1}{2}\right)\left(\cos x + \frac{2}{2}\right) = 0$

$(2\cos x - 1)(\cos x + 1) = 0$

$\cos x = \frac{1}{2}$ $\qquad$ $\cos x = -1$

$x = \frac{\pi}{3} + 2\pi n, \quad x = \frac{5\pi}{3} + 2\pi n, \; x = \pi + 2\pi n$

2.

LHS

$\frac{2\sin x\cos x}{1+\cos 2x} =$

$\frac{2\sin x\cos x}{1+2\cos^2 x - 1} =$

$\frac{2\sin x\cos x}{2\cos^2 x} =$

$\frac{\sin x}{\cos x} =$

$\tan x$

RHS

$\frac{\sec^2 x - 1}{\tan x}$

$\frac{\tan^2 x}{\tan x}$

$\tan x$

$LHS = RHS$

3.

$\sin 2x(\tan x + \cot x)$

$2\sin x\cos x\left(\frac{\sin x}{\cos x} + \frac{\cos x}{\sin x}\right)$

$2\sin x\cos x\left(\frac{\sin^2 x}{\cos x\sin x} + \frac{\cos^2 x}{\sin x\cos x}\right)$

$2\sin x\cos x\left(\frac{\sin^2 x + \cos^2 x}{\sin x\cos x}\right)$

$2\sin x\cos x\left(\frac{1}{\sin x\cos x}\right)$

2

4.

$$\frac{2\cos x + 2\cos^2 x}{\sin 2x}$$

$$\frac{2\cos x + 2\cos^2 x}{2\sin x\cos x}$$

$$\frac{2\cos x(1+\cos x)}{2\sin x\cos x}$$

$$\frac{1+\cos x}{\sin x}\left(\frac{1-\cos x}{1-\cos x}\right)$$

$$\frac{1-\cos^2 x}{\sin x(1-\cos x)}$$

$$\frac{\sin^2 x}{\sin x(1-\cos x)}$$

$$\frac{\sin x}{1-\cos x}$$

5.

$$3\cos^2 x + \cos x - 2 = 0$$

$$\cos^2 x + \cos x - 6 = 0$$

$$(\cos x - 2)(\cos x + 3) = 0$$

$$\left(\cos x - \frac{2}{3}\right)\left(\cos x + \frac{3}{3}\right) = 0$$

$$(3\cos x - 2)(\cos x + 1) = 0$$

$$\cos x = \frac{2}{3} \qquad \cos x = -1$$

$$x = 0.841, 5.442 \qquad x = \pi$$

6.

LHS

$$(\csc\theta - \sin\theta)\tan\theta$$

$$\left(\frac{1}{\sin\theta} - \sin\theta\right)\tan\theta$$

$$\left(\frac{1}{\sin\theta} - \frac{\sin^2\theta}{\sin\theta}\right)\tan\theta$$

$$\left(\frac{1-\sin^2\theta}{\sin\theta}\right)\tan\theta$$

$$\left(\frac{\cos^2\theta}{\sin\theta}\right)\tan\theta$$

$$\left(\frac{\cos^2\theta}{\sin\theta}\right)\left(\frac{\sin\theta}{\cos\theta}\right)$$

$$\cos\theta$$

LHS = RHS

RHS

$$\frac{\sin 2\theta}{2\sin\theta}$$

$$\frac{2\sin\theta\cos\theta}{2\sin\theta}$$

$$\cos\theta$$

7.

10a) $h = -25\cos\frac{2\pi}{40}t + 27$

10b) 12.07 seconds

8.

$$\frac{\sin x}{1-\sin x}-\frac{\sin x}{1+\sin x}$$

$$\frac{\sin x(1+\sin x)}{1-\sin x}-\frac{\sin x(1-\sin x)}{1+\sin x}$$

$$\frac{\sin x+\sin^2 x-\sin x+\sin^2 x}{(1-\sin x)(1+\sin x)}$$

$$\frac{2\sin^2 x}{1-\sin^2 x}$$

$$\frac{2\sin^2 x}{\cos^2 x}$$

$$2\tan^2 x$$

9.

$$\frac{\cot\theta}{\sin\theta-\csc\theta}$$

$$\frac{\frac{\cos\theta}{\sin\theta}}{\sin\theta-\frac{1}{\sin\theta}}$$

$$\frac{\frac{\cos\theta}{\sin\theta}}{\frac{\sin^2\theta}{\sin\theta}-\frac{1}{\sin\theta}}$$

$$\frac{\cos\theta}{\sin\theta}\div\left(\frac{\sin^2\theta-1}{\sin\theta}\right)$$

$$\frac{\cos\theta}{\sin\theta}\left(\frac{\sin\theta}{-\cos^2\theta}\right)$$

$$\frac{1}{-\cos\theta}$$

$$-\sec\theta$$