

MATHS

BOOKS - KC SINHA ENGLISH

TRIGONOMETRIC FUNCTIONS AND THEIR GRAPHS - FOR BOARDS

Solved Examples

1. Prove the following identities : $\sqrt{\frac{1 + \sin \theta}{1 - \sin \theta}} = \sec \theta + \tan \theta$

where θ is a acute



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2. Prove the identities : $(1 + \tan^2 \theta)(1 - \sin \theta)(1 + \sin \theta) = 1$



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3. Trigonometric identities



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4. Prove the identities:

$$(1 + \cot \theta - \cos \theta)(1 + \tan \theta + \sec \theta) = 2$$



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5. Show that :

$$\sin^8 A - \cos^8 A = (\sin^2 A - \cos^2 A)(1 - 2\sin^2 A \cdot \cos^2 A)$$



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6.

Show

that:

$$\frac{1}{\sec A - \tan A} - \frac{1}{\cos A} = \frac{1}{\cos A} - \frac{1}{\sec A + \tan A}$$



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7. Prove that $\frac{\sec \theta + \tan \theta - 1}{\tan \theta - \sec \theta + 1} = \frac{\cos \theta}{1 - \sin \theta}$



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8. Prove that : $\frac{\cos \theta}{1 - \tan \theta} + \frac{\sin \theta}{1 - \cot \theta} = \sin \theta + \cos \theta$



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9. about to only mathematics



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10. If $\cos^2 A - \sin^2 A = \tan^2 B$ then prove that

$$2\cos^2 B - 1 = \tan^2 A$$



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11. If $a \cos \theta - b \sin \theta = c$, then find the value of $a \sin \theta + b \cos \theta$.



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12. If $3 \sin \theta + 5 \cos \theta = 5$, show that: $5 \sin \theta - 3 \cos \theta = \pm 3$



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13. Prove the trigonometric identities: If $T_n = \sin^n \theta + \cos^n \theta$,

prove that $\frac{T_3 - T_5}{T_1} = \frac{T_5 - T_7}{T_3}$



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14. If $\frac{\cos^4 A}{\cos^2 B} + \frac{\sin^4 A}{\sin^2 B} = 1$, Prove that:

$$\sin^4 A + \sin^4 B = 2 \sin^2 A \sin^2 B$$



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15. If $\frac{\cos^4 A}{\cos^2 B} + \frac{\sin^4 A}{\sin^2 B} = 1$, then prove that

(i) $\sin^4 A + \sin^4 B = 2 \sin^2 A \sin^2 B$

(ii) $\frac{\cos^4 B}{\cos^2 A} + \frac{\sin^4 B}{\sin^2 A} = 1$



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16. If $\tan^2 \theta = 1 - e^2$, prove that

$$\sec \theta + \tan^3 \theta \cosec \theta = (2 - e^2)^{3/2}.$$



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17. If θ is an acute angle and $\tan \theta + \sec \theta = 1.5$, find $\sin \theta$, $\tan \theta$ and $\sec \theta$.



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18. If $\frac{\sin A}{\sin B} = p$ and $\frac{\cos A}{\cos B} = q$, find $\tan A$ and $\tan B$.



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20. If $\cos ec \theta - \sin \theta = m$ and $\sec \theta - \cos \theta = n$, then show that $(m^2 n)^{2/3} + (mn^2)^{2/3} = 1$.



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21. Which trigonometric ratios are positive for the following angles

(i) 210° (ii) -135° (iii) $\left(\frac{2\pi}{3}\right)^c$



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22. Find the values of the other five trigonometric functions in each

of the following: $\cot \theta = \frac{12}{5}$, θ in quadrant III



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23. Find the value of other five trigonometric function $\sin x = \frac{3}{5}$, x lies in second quadrant.



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24. If $\sin \theta = \frac{12}{13}$ and θ lies in the second quadrant, find the value of $\sec \theta + \tan \theta$.



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25. If $\cos \theta = \frac{1}{2}$ and π



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26. Find the minimum value of $\sec^2 \theta + \cos ec^2 \theta - 4$.



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27. If x is any real number then show that $\cos \theta$ cannot be equal to $x + \frac{1}{x}$.



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28. Find the values of the trigonometric function $\tan \frac{19\pi}{3}$

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29. Find the sign of $\sec 2000^\circ$.

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30. Draw the graph of $y = \sin x$ and $y = \sin \frac{x}{2}$.

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31. Draw the graph of $y = \cos x$ in $[-\pi, 2\pi]$.

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32. Draw the graph of $y = \tan x$ and find the period.

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33. Draw the graph of $y = \cot x$ and find the period.

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34. Draw graph of $y = \sec x$ and find the period

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35. Draw graph of $y = \operatorname{cosec} x$ and find the period.

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36. Draw the graph of $y = 3 \sin 2x$.



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37. Sketch the graph of $y = \cos\left(x - \frac{\pi}{4}\right)$.



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38. The ratio of the areas between the curves $y = \cos x$ and $y = \cos 2x$ and x-axis from $x = 0$ to $x = \frac{\pi}{3}$ is



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Exercise

1. Prove the identity $\sec^4 \theta - \sec^2 \theta = \tan^4 \theta + \tan^2 \theta$



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2. Prove : $\frac{\cos \theta}{1 + \sin \theta} + \frac{\cos \theta}{1 - \sin \theta} = 2 \sec \theta$



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3. Prove that $\cos^6 \theta + \sin^6 \theta = 1 - 3 \sin^2 \theta \cos^2 \theta$



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4. If $\pi < \theta < 2\pi$, then $\frac{1 + \cos \theta}{1 - \cos \theta}$ is equal to a. $\cos ec \theta + \cot \theta$ b.

c. $\cos ec \theta - \cot \theta$ d. $\cos ec \theta + \cot \theta$



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5. $(1 - \sin A - \cos A)^2 = 2(1 - \sin A)(1 - \cos A)$



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6. Prove that :

$$\sqrt{\sec^2 A + \cos ec^2 A} = \tan A + \cot A$$



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7. Prove that :

$$\sin A(1 + \tan A) + \cos A(1 + \cot A) = \sec A + \cos ec A.$$



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8. prove that $\frac{1}{\cos ec \theta - \cot \theta} - \frac{1}{\sin \theta} = \frac{1}{\sin \theta} - \frac{1}{\cos ec \theta + \cot \theta}$



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9. Prove that $\frac{\tan \theta}{\sec \theta - 1} + \frac{\tan \theta}{\sec \theta + 1} = 2 \csc \theta$



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10. Prove that $\cos \theta(\tan \theta + 2)(2 \tan \theta + 1) = 2 \sec \theta + 5 \sin \theta$



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11. $(1 + \tan \alpha \tan \beta)^2 + (\tan \alpha - \tan \beta)^2 =$



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12. Prove that $\frac{\cos^2 \alpha - \cos^2 \beta}{\cos^2 \alpha \cdot \cos^2 \beta} = \tan^2 \beta - \tan^2 \alpha$



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$$13. \frac{2\sin\theta \cdot \cos\theta - \cos\theta}{1 - \sin\theta + \sin^2\theta - \cos^2\theta} = \cot\theta$$



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$$14. \text{ If } \cos\theta + \sin\theta = \sqrt{2}\cos\theta \text{ prove that } \cos\theta - \sin\theta = \sqrt{2}\sin\theta$$



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$$15. \text{ If } \sin^4 A + \sin^2 A = 1 \text{ then prove that } \frac{1}{\tan^4 A} + \frac{1}{\tan^2 A} = 1$$



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$$16. \text{ If } \sin^4 A + \sin^2 A = 1, \text{ prove that: } \tan^4 A - \tan^2 A = 1$$



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17. If $\tan^2 \theta = 1 - m^2$, then show that:

$$\sec \theta + \tan^3 \theta \cdot \operatorname{cosec} \theta = (2 - m^2)^{3/2}$$



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18. If $\cos^2 A - \sin^2 A = \tan^2 B$ then prove that

$$2\cos^2 B - 1 = \tan^2 A$$



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19. If $T_n = \sin^n x + \cos^n x$, prove that $2T_6 - 3T_4 + 1 = 0$



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20. If θ is an acute angle and $\sin \theta = \frac{a^2 - b^2}{a^2 + b^2}$ ($a, b > 0$) find the values of $\tan \theta$, $\sec \theta$ and $\cos ec \theta$

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21. If $\sec A - \tan A = p$, $p > 0$, find $\tan A$, $\sec A$ and $\sin A$ if A is acute angle.

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22. If A and B are acute angles and $\frac{\sin A}{\sin B} = \sqrt{2}$ and $\frac{\tan A}{\tan B} = \sqrt{3}$, find A and B .

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23. If $\tan \theta + \cot \theta = 2$ find $\sin \theta$?



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24. If $\sin x + \cos x = a$, then prove that:

$$\sin^6 x + \cos^6 x = 1 - \frac{3}{4}(a^2 - 1)^2 \text{ where } a^2 \leq 2$$



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25. Eliminate θ from the following equation :

$$x = h + a \cos \theta, y = k + b \sin \theta$$



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26. Eliminate θ from the following equation :

$$x \cos \theta - y \sin \theta = a, x \sin \theta + y \cos \theta = b$$



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27. If $\sin \theta + \cos \theta = m$ and $\sec \theta + \csc \theta = n$ then

$n(m+1)(m-1)$ equals



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28. If

$x = r \sin \theta \cos \phi, y = r \sin \theta \sin \phi$ and $z = r \cos \theta$, then $x^2 + y^2 + z^2$

is independent of (a) θ, ϕ (b) r, θ (c) r, ϕ (d) r



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29. If $x \sin^3 \theta + y \cos^3 \theta = \sin \theta \cos \theta$ and $x \sin \theta = y \cos \theta$, Find

the value of $x^2 + y^2$.



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30. Which trigonometric ratios are negative for the angles: 315°

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31. Which trigonometric ratios are negative for the angles: -210°

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32. Which trigonometric ratios are negative for the angles:

$$\left(-\frac{5\pi}{6} \right)^c$$

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33. Find the value of the other five trigonometric functions :

$$\cos \theta = -\frac{8}{17}, \pi < \theta < \frac{3\pi}{2}.$$

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34. Find the value of other five trigonometric function
 $\cos x = -\frac{1}{2}$, x lies in third quadrant.



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35. Find the value of the other five trigonometric functions :
 $\cot \theta = -\frac{12}{5}$, $\frac{\pi}{2} < \theta < \pi$



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36. Find the value of the other five trigonometric functions :
 $\sec \theta = \frac{13}{5}$, $\frac{3\pi}{2} < \theta < 2\pi$



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37. Find the value of the other five trigonometric functions :

$$\tan \theta = \frac{4}{3}, \pi < \theta < \frac{3\pi}{2}$$



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38. If $\cot x = -\frac{5}{12}$, lies in second quadrant, find the values of other five trigonometric functions.



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39. If $\cos \theta = \frac{3}{5}$ and θ lies in the fourth quadrant, find the value of $\cos ec \theta + \cot \theta$.



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40. If $\tan \theta = -\frac{4}{3}$, $\frac{3\pi}{2} < \theta < 2\pi$, find the value of $9\sec^2 \theta - 4\cot \theta$.



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41. If $\sec \theta = \sqrt{2}$ and $\frac{3\pi}{2} < \theta < 2\pi$, find the value of $\frac{1 + \tan \theta + \cos ec \theta}{1 - \cot \theta - \cos ec \theta}$.



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42. If $\cos \theta = -\frac{3}{5}$ and $\pi < \theta < \frac{3\pi}{2}$, find the value of $\frac{\sec \theta - \tan \theta}{\cos ec \theta + \cot \theta}$



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43. If $\sin \alpha = \frac{3}{5}$, $\tan \beta = \frac{1}{2}$ and $\frac{\pi}{2} < \alpha < \pi < \beta < \frac{3\pi}{2}$, show that $8 \tan \alpha - \sqrt{5} \sec \beta = -\frac{7}{2}$.



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44. Prove that, $\sin^2 \theta + \cos ec^2 \theta \geq 2$



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45. Show that the equation $\sin \theta = x + \frac{1}{x}$ is not possible if x is real.



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46. Prove that $\sin^2 \theta = \frac{(x+y)^2}{4xy}$ is possible for real values of x and y only when $x = y, y \neq 0$ and $x \neq 0$.



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47. The equation $\sin^2 \theta = \frac{x^2 + y^2}{2xy}, x, y \neq 0$ is possible if



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48. Prove that : $\sec \theta + \cos \theta \neq \frac{3}{2}$



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49. Can $6\sin^2 \theta - 7\sin \theta + 2 = 0$ for any real value of θ ?



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50. Find the value of the trigonometric functions : $\sin 1830^\circ$



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51. Find the values of the trigonometric function $\sin 7650$



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52. Find the value of $\cos(-1710^\circ)$.



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53. Find the values of the trigonometric function $\sin\left(-11\frac{\pi}{3}\right)$



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54. Find the value of $\sin \frac{31\pi}{3}$.

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55. Find the values of the trigonometric function $\cot \left(-\frac{15\pi}{4} \right)$

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56. Find the value of the trigonometric functions: $\cot \frac{13\pi}{3}$

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57. Find the sign of the : $\tan 2500^\circ$

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58. Find the sign of the : $\cos(-2000^\circ)$

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59. Find the sign of the : $\cos ec(-3020^\circ)$.

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60. Sketch the graph : $y = \sin \frac{x}{2}$

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61. Sketch the graph : $y = 4 \cos 2x$

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62. Sketch the graph : $y = 3 \sin x$

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63. Sketch the graph : $y = 2 \tan x$

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64. Sketch the graph : $y = 2 \sin\left(x - \frac{\pi}{4}\right)$

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65. Draw the graph of the functions on the same axes: $y = \sin x$
and $y = \sin 2x$

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66. Draw the graph of $y = \sin x$ and $y = \cos x$, $0 \leq x \leq 2\pi$



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67. Draw the graph of the functions on the same axes: $y = \sin x$ and $y = \sin\left(x - \frac{\pi}{4}\right)$



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