PHYSICS

BOOKS - DISHA PHYSICS (HINGLISH)

MOTION IN A PLANE

Physics

1. A projectile is given an initial velocity of $\left(\hat{i}+2\hat{j}\right)m/s$, where $\hat{i}$ is along the ground

and $\hat{j}$ is along the vertical . If $g = 10m/s^2$, the equation of its trajectory is :

A. $y = x - 5x^2$

B. $y = 2x - 5x^2$

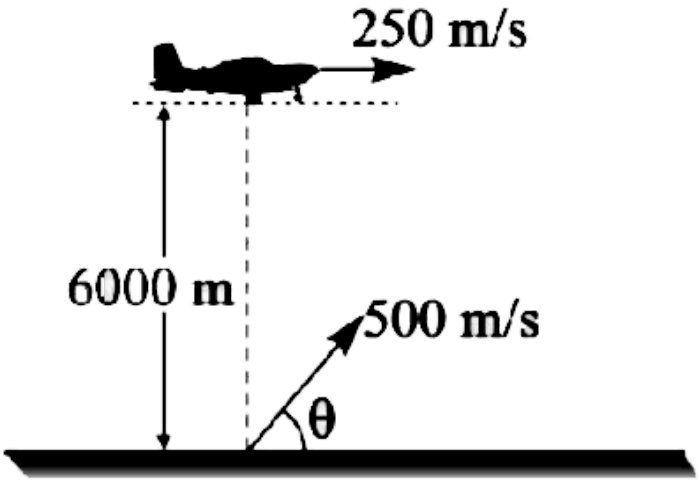
C. $4y = 2x - 5x^2$

D. $4y = 2x - 25x^2$

Answer:

Watch Video Solution

2. An aircraft moving with a speed of 250 m/s is at a height of 6000 m, just overhead of an anti aircraft–gun. If the muzzle velocity is 500 m/s the firing angle θ should be:



A. 30°

B. 45°

C. 60°

D. 75°

Answer:

Watch Video Solution

3. Two racing cars of masses m_1 and m_2 are moving in circles of radii r_1 and r_2 respectively. Their speeds are such that each makes a complete circle in the same duration

of time t. The ratio of the angular speed of the first to the second car is

A. $m_1 : m_2$

B. $r_1 : r_2$

C. $1 : 1$

D. $m_1 r_1 : m_2 r_2$

Answer:

Watch Video Solution

4. A boy playing on the roof of a $10m$ high building throws a ball with a speed of $10m/s$ at an angle of $30(\circ)$ with the horizontal. How far from the throwing point will the ball be at the height of $10m$ from the ground ?

$$\left[g = 10m/s^2, \sin 30^\circ = \frac{1}{2}, \cos 30^\circ = \frac{\sqrt{3}}{2}\right]$$

A. 5.20m

B. 4.33m

C. 2.60m

D. 8.66m

Answer:

Watch Video Solution

5. A bomber plane moves horizontally with a speed of $600m/s$ and a bomb released from it, strikes the ground in $10s$. The angle with horizontally at which it strikes the ground will be

A. $\tan^{-1}\left(\frac{1}{5}\right)$

B. $\tan\left(\frac{1}{5}\right)$

C. $\tan^{-1}\left(\frac{1}{5}\right)$

D. $\tan^{-1}(5)$

Answer:

Watch Video Solution

6. Two particles start simultaneously from the same point and move along two straight lines. One with uniform velocity v and other with a uniform acceleration a. if α is the angle between the lines of motion of two particles

then the least value of relative velocity will be at time given by

A. $\frac{v}{a}\sin\alpha$

B. $\frac{v}{a}\cos\alpha$

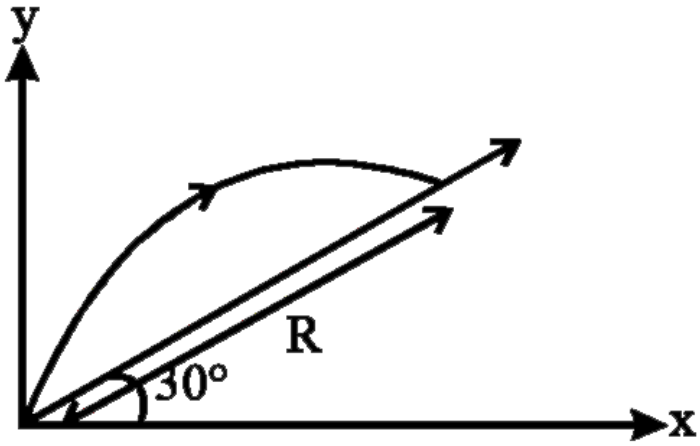
C. $\frac{v}{a}\tan\alpha$

D. $\frac{v}{a}\cot\alpha$

Answer:

Watch Video Solution

7. Initial velocity with which a body is projected is 10 $m/\sec$ and angle of projection is 60°. Find the range R



A. $\frac{15\sqrt{3m}}{2}$

B. $\frac{40}{3}m$

C. $5\sqrt{3m}$

D. $\frac{20}{3}$

Answer:

Watch Video Solution

8. The position vectors of points A,B,C and D are $A = 3\hat{i} + 4\hat{j} + 5\hat{k}, B = 4hai + 5\hat{j} + 6\hat{k}$, $C = 7\hat{i} + 9\hat{j} + 3\hat{k}$, and $D = 4\hat{i} + 6\hat{j}$, then the displacement vectors AB and CD are

A. perpendicular

B. parallel

C. antiparallel

D. inclined at an angle of 60°

Answer:

Watch Video Solution

9. A person aiming to reach the exactly opposite point on the bank of a stream is swimming with a speed of $0.5\frac{m}{s}$ at an angle

of 120° with the direction of flow of water. The speed of water in the stream is

A. $1.0m/s$

B. $0.5m/s$

C. $0.25m/s$

D. $0.43m/s$

Answer:

Watch Video Solution

10. A projectile thrown with velocity v making angle θ with vertical gains maximum height H in the time for which the projectile remains in air, the time period is

A. $\sqrt{H\cos\theta/g}$

B. $\sqrt{2H\cos\theta/g}$

C. $\sqrt{4H/g}$

D. $\sqrt{8H/g}$

Answer:

Watch Video Solution

Watch Video Solution

11. A ball is thrown from a point with a speed 'v^(0)' at an elevation angle of θ . From the same point and at the same instant , a person starts running with a constant speed $\frac{'v_0'}{2}$ to catch the ball . Will the person be able to catch the ball ? If yes, what should be the angle of projection θ ?

A. $No, 0^\circ$

B. $yes, 30^\circ$

C. $yes, 60^\circ$

D. $yes, 45^\circ$

Answer:

Watch Video Solution

12. If Vectors $\vec{A} = \cos\omega\hat{i} + \sin\omega\hat{j}$ and $\vec{B} = (\cos)\frac{\omega t}{2}\hat{i} + (\sin)\frac{\omega t}{2}\hat{j}$ are functions of time. Then the value of t at which they are orthogonal to each other is

A. $t = \frac{\pi}{2\omega}$

B. $t = \frac{\pi}{\omega}$

C. t=0

D. $t = \frac{\pi}{4\omega}$

Answer:

Watch Video Solution

13. A bus is moving on a straight road towards north with a uniform speed of 50 $km/hour$ turns through 90°. If the speed remains

unchanged after turning, the increase in the velocity of bus in the turning process is

A. 70.7 $km/hour$ along south-west direction

B. 70.7 $km/hour$ along north-west direction.

C. 50 $km/hour$ along west

D. zero

Answer:

Watch Video Solution

14. The velocity of projection of oblique projectile is $\left(6\hat{i}+8\hat{j}\right)ms^{-1}$ The horizontal range of the projectile is

A. 4.9 m

B. 9.6 m

C. 19.6 m

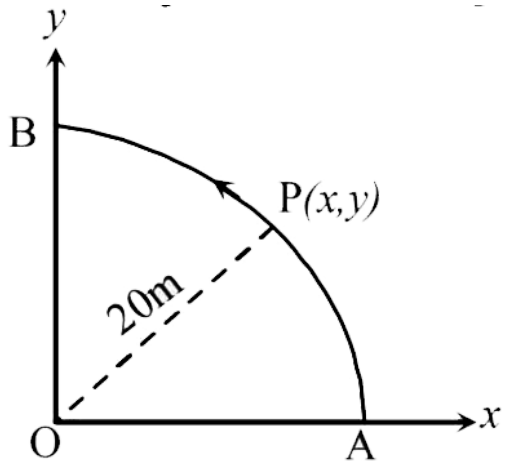
D. 14 m

Answer:

Watch Video Solution

15. A point p moves in counter - clockwise direction on a circular path as shown in the figure . The movement of 'p' is such that it sweeps out in the figure . The movement of 'p' is such that it sweeps out a length $s = t^3 + 5$, where s is in metres and t is in seconds . The radius of the path is $20m$. The acceleration of

'P' when $t = 2s$ is nearly .



A. 13 m/s^2

B. 12 m/s^2

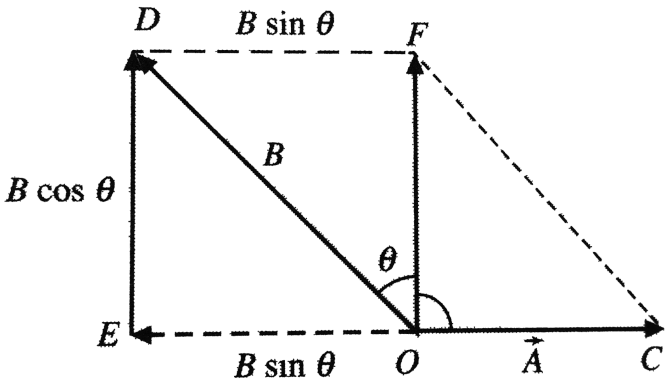
C. $7.2ms^2$

D. 14 m/s^2

Answer:

Watch Video Solution

16. The resultant of two vectors $\vec{A}$ and $\vec{B}$ is perpendicular to the vector $\vec{A}$ and its magnitude is equal to half of the magnitude of the vector $\vec{B}$. Find out the angles between $\vec{A}$ and $\vec{B}$.



A. 120°

B. 150°

C. 135°

D. 180°

Answer:

Watch Video Solution

17. A man starts running along a straight road with uniform velocity observes that the rain is falling vertically downward. If he doubles his

speed, he finds that the rain is coming at an angle θ to the vertical. The velocity of rain with respect to the ground is :

A. ui-uj

B. $ui - \frac{u}{\tan\theta}\hat{j}$

C. $2u\hat{j} + u\cot\theta\hat{j}$

D. $ui + u\sin\theta\hat{j}$

Answer:

Watch Video Solution

18. Two projectiles A and B thrown with speeds in the ratio $1 : \sqrt{2}$ acquired the same heights. If A is thrown at an angle of 45° with the horizontal, the angle of projection of B will be

A. 0°

B. 60°

C. 30°

D. 45°

Answer:

Watch Video Solution

19. A projectile can have the same range 'R' for two angles of projection . If $'T_1'$ and $'T_2'$ to be times of flights in the two cases, then the product of the two times of flights is directly proportional to .

A. R

B. $\frac{1}{R}$

C. $\frac{1}{R^2}$

D. R^2

Answer:

Watch Video Solution

20. A man standing on the roof a house of height h throws one particle vertically downwards and another particle horizontally with same velocity u. Find the ratio of their velocities when they reach the earth's surface.

A. $\sqrt{2gh + u^2} : u$

B. $1 : 2$

C. $1:1$

D. $\sqrt{2gh+u^2}:\sqrt{2gh}$

Answer:

Watch Video Solution

21. If a unit vector is represented by $0.5\hat{i}+0.8\hat{j}+c\hat{k}$ the value of c is

A. 1

B. $\sqrt{0.11}$

C. $\sqrt{0.01}$

D. 0.39

Answer:

Watch Video Solution

22. An aeroplane is flying in a horizontal direction with a velocity $600 km / h$ at a height of 1960 m. When it is vertically above the point A on the ground, a body is dropped from it.

The body strikes the ground at point B. Calculate the distance AB.

A. on a parabolic path as seen by pilot in the plane

B. vertically along a straight path as seen by an observer on the ground near the target

C. on a parabolic path as seen by an observer on the ground near the target

D. on a zig-zag path as seen by pilot in the plane

Answer:

Watch Video Solution

23. A particle is projected with a velocity v so that its range on a horizontal plane is twice the greatest height attained. If g is acceleration due to gravity, then its range is

A. $\frac{4v^2}{5g}$

B. $\frac{4g}{5v^2}$

C. $\frac{V^2}{g}$

D. $\frac{4V^2}{\sqrt{5g}}$

Answer:

Watch Video Solution

24. Two particles are projected with same speed but at angles of projection $(45^\circ - \theta)$

and $(45^\circ + \theta)$. Then their horizontal ranges are in the ratio of

A. $1:1$

B. $1:2$

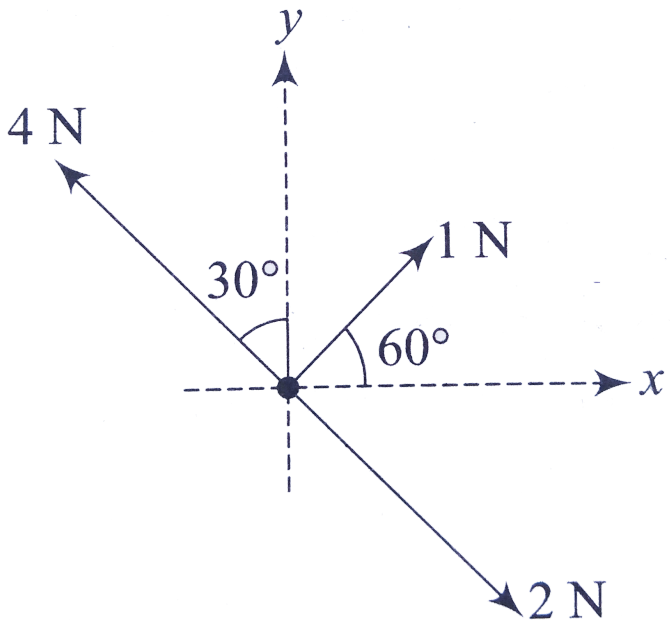
C. $1:3$

D. $1:4$

Answer:

Watch Video Solution

25. Three forces acting on a body are shown in figure. To have the resultant force only along the y-directon, the magnitude of the minimum additional force needed si



A. 0.5 N

B. 1.5N

C. $\frac{\sqrt{3}}{4}N$

D. $\sqrt{3N}$

Answer:

Watch Video Solution

26. A particle moves in the $x - y$ plane under the action of a force $\overrightarrow{F}$ such that the value of its linear momentum $\overrightarrow{P}$ at any time $tisP_x = 2\cos t, P_y = 2\sin t.$

The angle θ between vecF and vecP $at a given time t$ will be:

A. $\theta = 30^\circ$

B. $\theta = 180^\circ$

C. $\theta = 180^\circ$

D. $\theta = 90^\circ$

Answer:

Watch Video Solution

27. A person sitting in the rear end of the compartment throws a ball towards the front end. The ball follows a parabolic path. The train is moving with uniform velocity of $20ms^{-1}$. A person standing outside on the ground also observers the ball. How will the maximum heights (h_m) attained and the ranges (R) seen by thrower and the outside observer compare each other?

A. Same y_m differentR

B. Same y_m

C. Differentl y_m same R

D. Different y_m and R

Answer:

Watch Video Solution

28. If a particle moves in a circle describing equal angles in equal intervals of time, then the velocity vector.

A. Magnitude of velocity is not constant

B. Both magnitude and direction of velocity change

C. Velocity is directed towards the centre of the circle

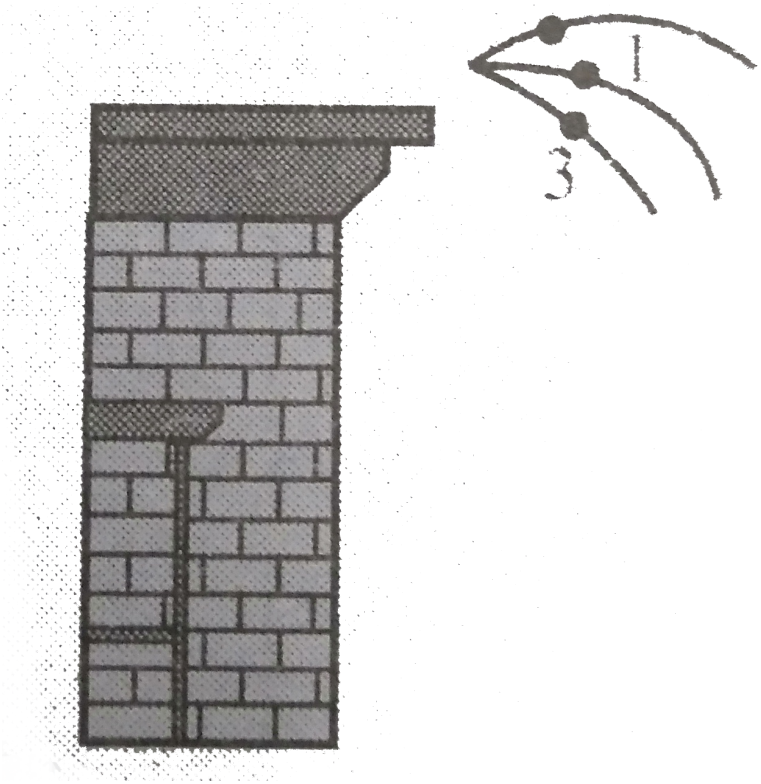
D. Magnitude of velocity is constant but direction changes

Answer:

Watch Video Solution

29. Three identical balls are thrown from the top of a building, all with the same initial speed. As shown in figure., the first ball is thrown horizontally, second above horizontal level, and third at an angle below the horizontal. Neglecting air resistance, rank the speeds of the balls at the instant each hits the

ground.



A. $v_A = v_B = v_C$

B. $v_A = v_B > v_C$

C. $v_B > v_C > v_A$

D. $v_A > v_B = v_C$

Answer:

Watch Video Solution

30. A particle is moving such that its position coordinates (x, y) are $(2m, 3m)$ at time $t = 0$, $(6m, 7m)$ at time $t = 2s$, and $(13m, 14m)$ at time $t = 5s$.

Average velocity vector $\left(\overrightarrow{V}_{av}\right)$ from $t = 0$ to $t = 5s$ is

A. $\frac{1}{5}\left(13\hat{i}+14\hat{j}\right)$

B. $\frac{7}{3}\left(\hat{i}+\hat{j}\right)$

C. $2\left(\hat{i}+\hat{j}\right)$

D. $\frac{11}{5}\left(\hat{i}+\hat{j}\right)$

Answer:

Watch Video Solution

31. A particle moves so that its position vector is given by $\overrightarrow{r} = \cos\omega t\hat{x} + \sin\omega t\hat{y}$, where ω is a constant which of the following is true ?

A. Velocity and acceleration both are perpendicular to $\overrightarrow{r}$

B. Velocity and acceleration both are parallel to $\overrightarrow{r}$

C. Velocity is perpendicular to $\overrightarrow{r}$ and acceleration is directed towards the origin

D. Velocity is perpendicular to $\overrightarrow{r}$ and acceleration is directed away from the origin

Answer:

Watch Video Solution

32. Two boys are standing at the ends A and B of a ground, where $AB = a$. The boy at B starts running in a direction perpendicular to AB with velocity v_1. The boy at A starts running simultaneously with velocity v and catches the other boy in a time t, where t is :

A. $a / \sqrt{V^2 + V_1^2}$

B. $a/(v+v_1)$

C. $a/(v-v_1)$

D. $\sqrt{a^2/(v^2-v_1^2)}$

Answer:

Watch Video Solution

33. A projectile is fired at an angle of 45° with the horizontal. Elevation angle of the projection at its highest point as seen from the point of projection is

A. 60°

B. $\tan^{-1}\left(\frac{1}{2}\right)$

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

D. 45°

Answer:

Watch Video Solution

34. The position vector of a particle $\vec{R}$ as a funtion of time is given by:

$\overrightarrow{R} = 4\sin(2\pi t)\hat{i} + 4\cos(2\pi t)\hat{j}$

Where R is in meters, t is in seconds and $\hat{i}$ and $\hat{j}$ denote until vectors along x-and y-directions, respectively Which one of the following statements is wrong for the motion of particle ?

A. Magnitude of acceleration vector is $\frac{V^2}{R}$ where v is the velocity of particle

B. Magnitude of the velocity of particle is 8 $meter/\sec ond$

C. Path of the particle is a circle of radius 4 meter

D. Acceleration vector is along $\vec{R}$

Answer:

Watch Video Solution

35. The vectors $\vec{A}$ and $\vec{B}$ uur are such that $|\vec{A}+\vec{B}|=|\vec{A}-\vec{B}|$ The angle between the two vectors is

A. 60°

B. 75°

C. 45°

D. 90°

Answer:

Watch Video Solution

36. The velocity of projection of oblique projectile is $\left(6\hat{i}+8\hat{j}\right)ms^{-1}$ The horizontal range of the projectile is

A. 4.9m

B. 9.6m

C. 19.6m

D. 14m

Answer:

Watch Video Solution

37. An artillary piece which consistently shoots its shells with the same muzzle speed has a maximum range R. To hit a target which is

$R/2$ from the gun and on the same level, the elevation angle of the gun should be

A. 15°

B. 45°

C. 30°

D. 60°

Answer:

Watch Video Solution

38. A car runs at a constant speed on a circular track of radius 100m, taking 62.8s for every circular loop. The average velocity and average speed for each circular loop respectively is:

A. 0,10m/s

B. 10m/s,10m/s

C. 10m$/s$,0

D. 0,0

Answer:

Watch Video Solution

Watch Video Solution

39. A vector of magnitude b is rotated through angle θ. What is the change in magnitude of the vector?

A. $2b\sin\frac{\theta}{2}$

B. $2b\cos\frac{\theta}{2}$

C. $2b\sin\theta$

D. $2b\cos\theta$

Answer:

Watch Video Solution

40. A stone projected with a velocity u at an angle (theta)with the horizontal reaches maximum heights H_1. When it is projected with velocity u at an angle $\left(\frac{\pi}{2} - \theta\right)$ with the horizontal, it reaches maximum height H_2. The relations between the horizontal range R of the projectile, H_1 and H_2, is

A. $R = 4\sqrt{H_1 H_2}$

B. $R = 4(H_1 - H_2)$

C. $R = 4(H_1 + H_2)$

D. $R = \frac{H_1^2}{H_2^2}$

Answer:

Watch Video Solution

41. The vector sum of two forces is perpendicular to their vector differences. In that case, the forces

Watch Video Solution

42. A particle starts from the origin of coordinates at time t = 0 and moves in the xy plane with a constant acceleration α in the y-direction. Its equation of motion is $y = \beta x^2$. Its velocity component in the x-direction is

A. $\frac{\sqrt{2b}}{a}$

B. $\frac{\sqrt{a}}{2b}$

C. $\frac{\sqrt{a}}{b}$

D. $\frac{\sqrt{b}}{a}$

Answer:

Watch Video Solution

43. A vector $\overrightarrow{A}$ ur is rotated by a small angle $\triangle\theta$ radian ($\triangle\theta < l$) to get a new vector $\overline{B}$ In that case $\left|\overrightarrow{B} - \overrightarrow{A}\right|$ is:

A. $\left|\overrightarrow{A}\right| \triangle\theta$

B. $\left|\overrightarrow{B}\right| \triangle\theta - \left|\overrightarrow{A}\right|$

C. $\left|\overrightarrow{A}\right|\left(1 - \frac{\triangle\theta^2}{2}\right)$

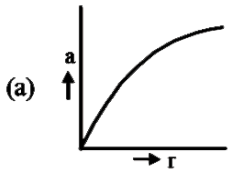
D. 0

Answer:

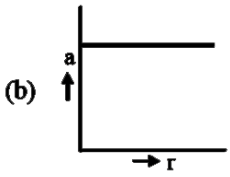
Watch Video Solution

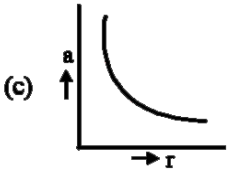
44. If a body moving in circular path maintains constant speed of 10 ms^{-1}, then which of the following correctly describes relation between acceleration and radius ?

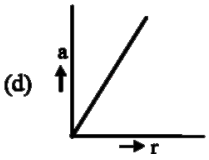
A.



B.



C. 

D. 

Answer:

Watch Video Solution

45. The position of a projectile launched from the origin at t = 0 is given by $vacr=\left(40\hat{i}+50\hat{j}\right)$mat t=2s. if the projectile was

launched at an angle θ from the horizontal, then $\theta$is (take g = 10 ms^{-2}

A. $\tan^{-1}\frac{2}{3}$

B. $\tan^{-1}\frac{3}{2}$

C. $\tan^{-1}\frac{7}{4}$

D. $\tan-1\frac{4}{5}$

Answer:

Watch Video Solution