# NDA 1 2025

LIVE

# MATHS

## ANALYTICAL GEOMETRY 2D

CLASS 5


NAVJYOTI SIR

Crack
EXAMS

# 25 Oct 2024 Live Classes Schedule

| | | |
|---|---|---|
| 8:00AM | 25 OCTOBER 2024 DAILY CURRENT AFFAIRS | RUBY MA'AM |
| 9:00AM | 25 OCTOBER 2024 DAILY DEFENCE UPDATES | DIVYANSHU SIR |

## NDA 1 2025 LIVE CLASSES

| | | |
|---|---|---|
| 11:30AM | GK - POLITY - EMERGENCY | RUBY MA'AM |
| 1:00PM | CHEMISTRY - ISOLATION TECHNIQUES | SHIVANGI MA'AM |
| 4:00PM | MATHS - ANALYTICAL GEOMETRY 2D - CLASS 5 | NAVJYOTI SIR |
| 5:30PM | ENGLISH - USE OF PHRASAL VERBS - CLASS 2 | ANURADHA MA'AM |

## CDS 1 2025 LIVE CLASSES

| | | |
|---|---|---|
| 11:30AM | GK - POLITY - EMERGENCY | RUBY MA'AM |
| 1:00PM | CHEMISTRY - ISOLATION TECHNIQUES | SHIVANGI MA'AM |
| 5:30PM | ENGLISH - USE OF PHRASAL VERBS - CLASS 2 | ANURADHA MA'AM |
| 7:00PM | MATHS - MENSURATION 2D - CLASS 1 | NAVJYOTI SIR |

## AFCAT 1 2025 LIVE CLASSES

| | | |
|---|---|---|
| 4:00PM | STATIC GK - POLITY - CLASS 1 | DIVYANSHU SIR |
| 7:00PM | MATHS - MENSURATION 2D - CLASS 1 | NAVJYOTI SIR |



**Q)** The bisector of the acute angle between the straight lines $3x - 4y - 3 = 0$ and $12x + 5y + 6 = 0$ passes through which one of the following points ?

(a) $(5, 3)$ (b) $(-3, 6)$

(c) $(2, 7)$ ✓ (d) $(-1, 4)$

If a point $(x, y)$ is taken on bisector, then it will be equidistant from both the lines.

$$\frac{|3x - 4y - 3|}{\sqrt{3^2 + y^2}} = \frac{|12x + 5y + 6|}{\sqrt{12^2 + 5^2}} \Rightarrow \frac{3x - 4y - 3}{5} = -\frac{(12x + 5y + 6)}{13}$$

$$\frac{3x - 4y - 3}{5} = \frac{-12x - 5y - 6}{13}$$

$$39x - 52y - 39 = -60x - 25y - 30$$

$$99x - 27y - 9 = 0$$

$$11x - 3y - 1 = 0$$

$$11x - 3y = 1$$

put options and check

(2, 7) satisfies

Which one of the following points on the line $2x - 3y = 5$ is equidistant from $(1, 2)$ and $(3, 4)$?

(a) $(7, 3)$ (b) $(4, 1)$ ✓

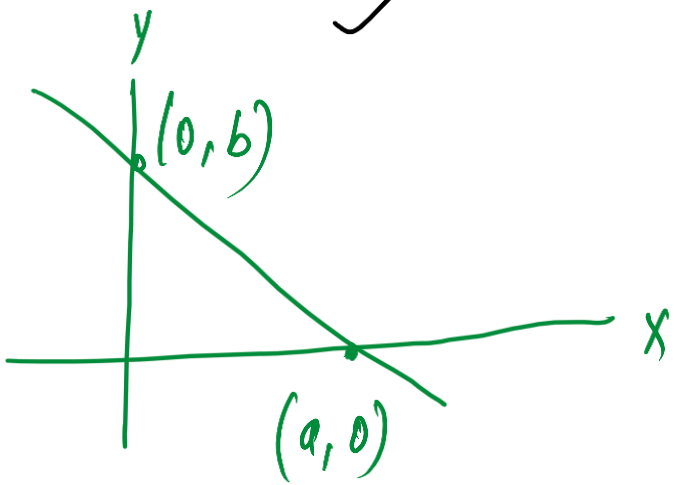
(c) $(1, -1)$ (d) $(-2, -3)$

(a) $\sqrt{37}$ ; $\sqrt{17}$ ✗

(b) $\sqrt{10}$ ; $\sqrt{10}$ ✓

What is the equation of the straight line passing through the point (2, 3) and making an intercept on the positive $Y$-axis equal to twice its intercept on the positive $X$-axis?

(a) $2x + y = 5$ (b) $2x + y = 7$ (c) $x + 2y = 7$ (d) $2x - y = 1$




$b = 2a$

$\frac{x}{a} + \frac{y}{b} = 1$

$\frac{x}{a} + \frac{y}{2a} = 1$

$2x + y = 2a$

passing point $\rightarrow (2, 3)$

$y + 3 = 2a$

$a = \frac{7}{2}$

$2x + y = 7$

What is the radius of the circle

$4x^2 + 4y^2 - 20x + 12y - 15 = 0$?

(a) 14 units (b) 10.5 units

(c) 7 units (d) 3.5 units ✓

Standard form $\longrightarrow$ $x^2 + y^2 + 2gx + 2fy + c = 0$

$x^2 + y^2 - 5x + 3y - \frac{15}{4} = 0$

radius $= \sqrt{g^2 + f^2 - c} = \sqrt{\left(\frac{-5}{2}\right)^2 + \left(\frac{3}{2}\right)^2 + \frac{15}{4}} = \sqrt{\frac{49}{4}} = \frac{7}{2} = 3.5$ units

The diagonals of a quadrilateral $ABCD$ are along the lines $x-2y=1$ and $4x+2y=3$. The quadrilateral $ABCD$ may be a

**( PYQ – 2024 – II)**

(a) rectangle

(b) cyclic quadrilateral

(c) parallelogram

(d) rhombus ✓

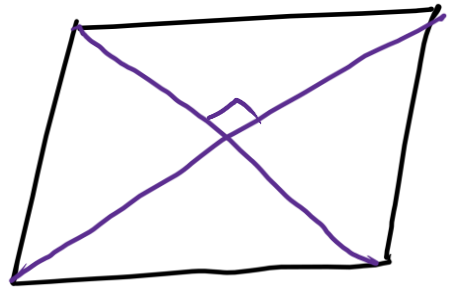
$x-2y=1 \longrightarrow m_1 \text{ (slope)} = \frac{-1}{-2} = \frac{1}{2}$

$4x+2y=3 \longrightarrow m_2 = \frac{-4}{2} = -2$

$-ve$ reciprocals

$m_1 \cdot m_2 = -1$

$\Rightarrow$ Diagonals are at 90° to each other



( PYQ – 2024 – I)

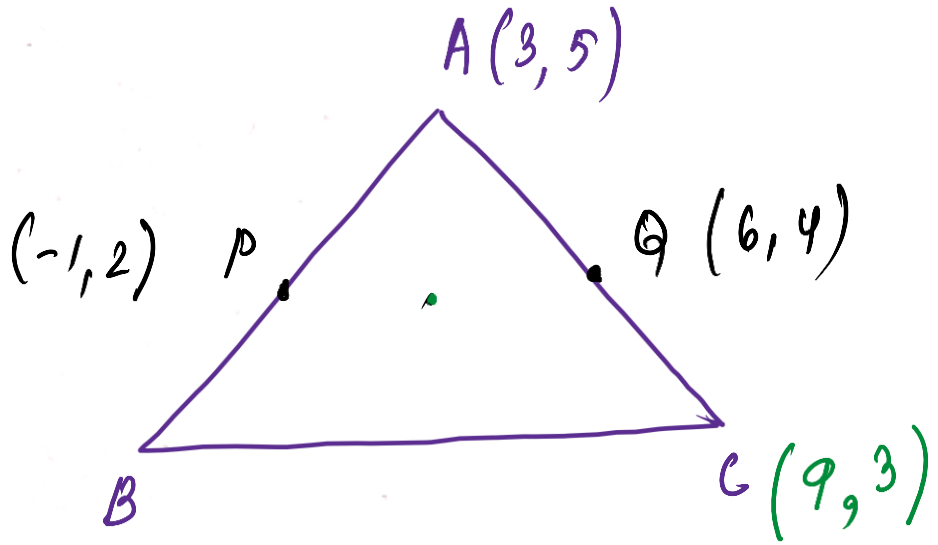
*ABC* is a triangle with $A(3, 5)$. The mid-points of sides *AB*, *AC* are at $(-1, 2)$, $(6, 4)$ respectively. What are the coordinates of centroid of the triangle *ABC*?

(a) $\left(\frac{8}{3}, \frac{11}{3}\right)$

(b) $\left(\frac{7}{3}, \frac{7}{3}\right)$ ✓

(c) $\left(2, \frac{8}{3}\right)$

(d) $\left(\frac{8}{3}, 2\right)$




$(-5, -1)$

$$\text{centroid} \rightarrow \left(\frac{x_1+x_2+x_3}{3}, \frac{y_1+y_2+y_3}{3}\right) = \left(\frac{7}{3}, \frac{7}{3}\right)$$

( PYQ – 2024 – I)

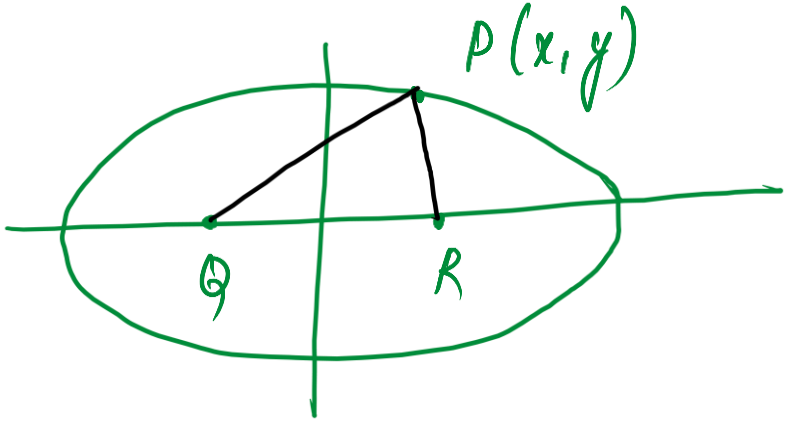
The foci of the ellipse $4x^2 + 9y^2 = 1$ are at $Q$ and $R$. If $P(x, y)$ is any point on the ellipse, then what is $PQ + PR$ equal to?

(a) 2

(b) 1 ✓

(c) 2/3

(d) 1/3




$\frac{x^2}{1/4} + \frac{y^2}{1/9} = 1$ $\left(\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1\right)$

$a^2 = \frac{1}{4}$

$a = \frac{1}{2}$

$PQ + PR$ = Length of major axis $= 2a = 1$

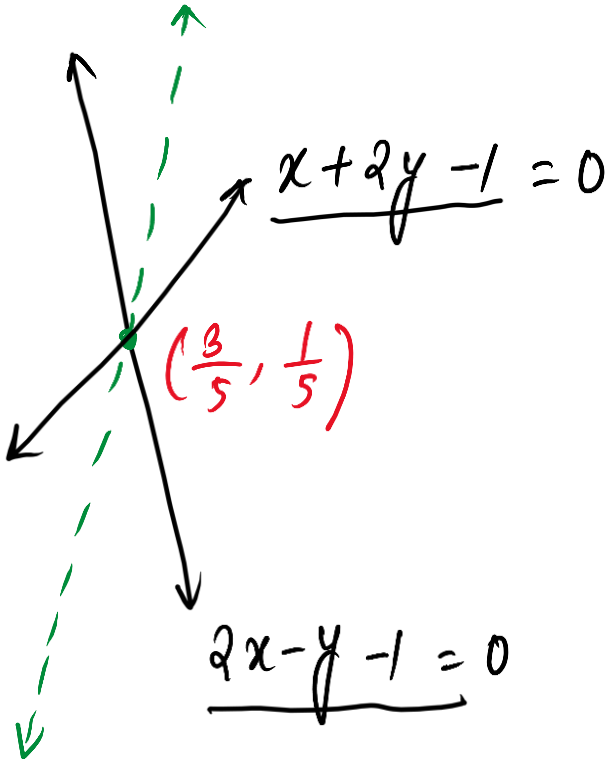
If a variable line passes through the point of intersection of the lines $x + 2y - 1 = 0$ and $2x - y - 1 = 0$ and meets the coordinate axes in $A$ and $B$, then what is the locus of the mid-point of $AB$ ?

(a) $3x + y = 10xy$

(b) $x + 3y = 10xy$ ✓

(c) $3x + y = 10$

(d) $x + 3y = 10$




$$\begin{cases} 2x + 4y = 2 \\ 2x - y = 1 \end{cases}$$

$$5y = 1 \Rightarrow y = \frac{1}{5}$$

$$x = \frac{6}{10} = \frac{3}{5}$$

$$\begin{cases} x = 3/5 \\ y = 1/5 \end{cases}$$

These values of $x$ and $y$ should satisfy given locus (eqn.)

. What is the equation to the straight line passing through the point $(-\sin\theta, \cos\theta)$ and perpendicular to the line $x\cos\theta + y\sin\theta = 9$ ?

(a) $x\sin\theta - y\cos\theta - 1 = 0$

(b) $x\sin\theta - y\cos\theta + 1 = 0$ ✓

(c) $x\sin\theta - y\cos\theta = 0$

(d) $x\cos\theta - y\sin\theta + 1 = 0$

Two points $P$ and $Q$ lie on line $y = 2x + 3$. These two points $P$ and $Q$ are at a distance 2 units from another point $R(1, 5)$. What are the coordinates of the points $P$ and $Q$?

(a) $\left(1+\frac{2}{\sqrt{5}}, 5+\frac{4}{\sqrt{5}}\right), \left(1-\frac{2}{\sqrt{5}}, 5-\frac{4}{\sqrt{5}}\right)$

(b) $\left(3+\frac{2}{\sqrt{5}}, 5+\frac{4}{\sqrt{5}}\right), \left(-1-\frac{2}{\sqrt{5}}, 5-\frac{4}{\sqrt{5}}\right)$

(c) $\left(1-\frac{2}{\sqrt{5}}, 5+\frac{4}{\sqrt{5}}\right), \left(1+\frac{2}{\sqrt{5}}, 5-\frac{4}{\sqrt{5}}\right)$

(d) $\left(3-\frac{2}{\sqrt{5}}, 5+\frac{4}{\sqrt{5}}\right), \left(-1+\frac{2}{\sqrt{5}}, 5-\frac{4}{\sqrt{5}}\right)$

$y = 2x + 3$

$5 + \frac{4}{\sqrt{5}} = 2x + 3$

$2 + \frac{4}{\sqrt{5}} = 2x$

$x = 1 + \frac{2}{\sqrt{5}}$

If two sides of a square lie on the lines $2x + y - 3 = 0$ and $4x + 2y + 5 = 0$, then what is the area of the square in square units ?

(a) 6·05 ✓

(b) 6·15

(c) 6·25

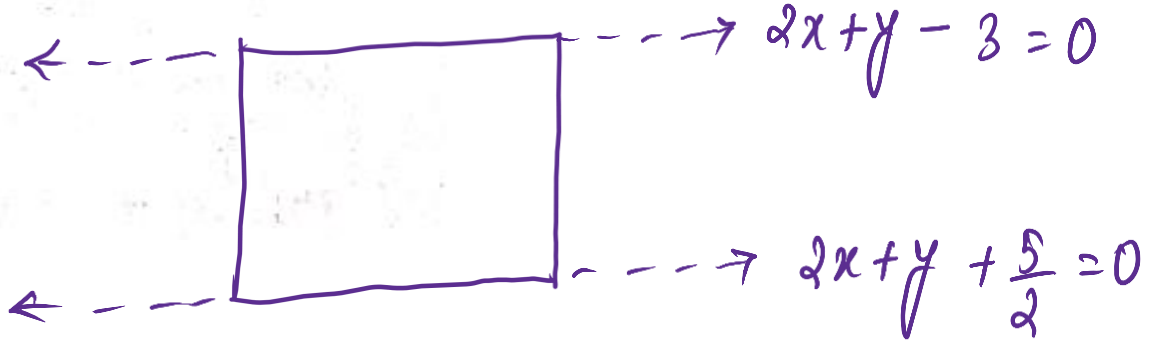
(d) 6·35

$2x + y - 3 = 0$

$4x + 2y + 5 = 0 \longrightarrow 2x + y + \frac{5}{2} = 0$

Slopes are equal

Lines are parallel.




Length of side = distance between parallel lines $= \frac{\left|\frac{5}{2} + 3\right|}{\sqrt{2^2 + 1^2}} = \frac{11/2}{\sqrt{5}}$

$$\text{Area} = \left(\frac{11}{2\sqrt{5}}\right)^2 = \frac{121}{20} = 6.05$$

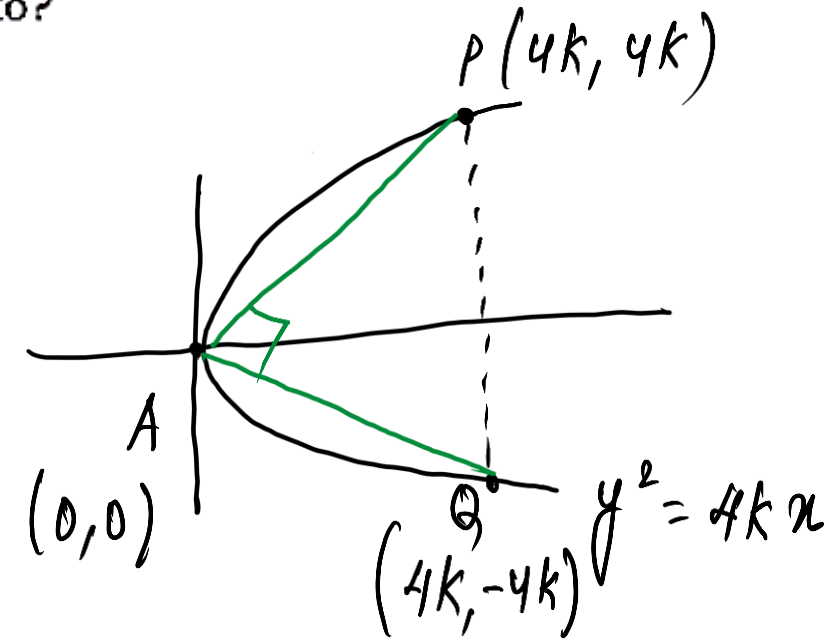
Consider the points $P(4k, 4k)$ and $Q(4k, -4k)$ lying on the parabola $y^2 = 4kx$. If the vertex is $A$, then what is $\angle PAQ$ equal to?

(a) 60°

(b) 90° ✓

(c) 120°

(d) 135°




AP (slope) = 1 —— $m_1$

AQ (slope) = -1 —— $m_2$

$m_1 \cdot m_2 = -1$

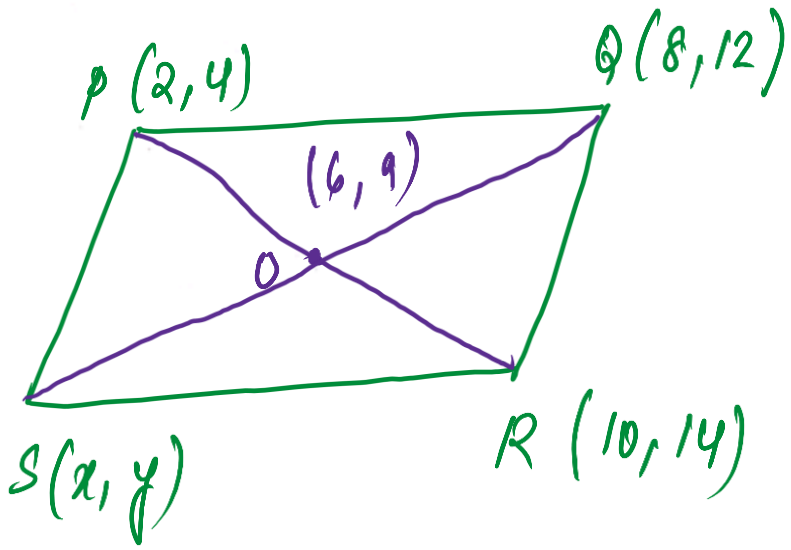
If $P(2, 4)$, $Q(8, 12)$, $R(10, 14)$ and $S(x, y)$ are vertices of a parallelogram, then what is $(x + y)$ equal to?

(a) 8

(b) 10 ✓

(c) 12

(d) 14




Diagonals bisect at O.

$$O \longrightarrow \left(\frac{2+10}{2}, \frac{4+14}{2}\right) = (6, 9)$$

$$x = 4 \; ; \; y = 6 \longrightarrow \underline{x + y = 10}$$

A triangle $ABC$ is inscribed in the circle $x^2 + y^2 = 100$. $B$ and $C$ have coordinates (6, 8) and (−8, 6) respectively.

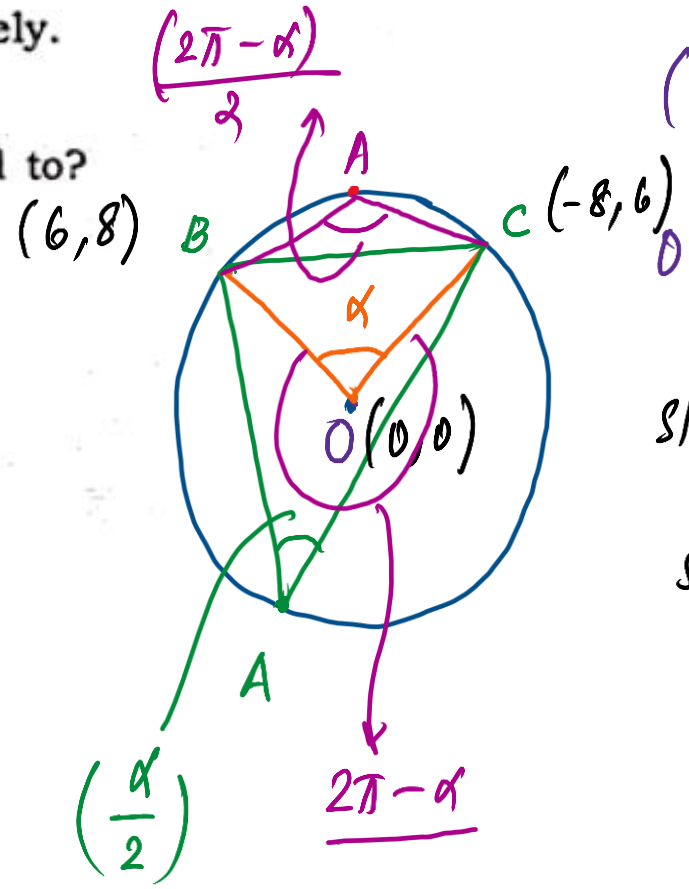
What is $\angle BAC$ equal to?

(a) $\pi/2$

(b) $\pi/3$ or $2\pi/3$

(c) $\pi/4$ or $3\pi/4$

(d) $\pi/6$ or $5\pi/6$




$x^2 + y^2 = 100$

$(x-0)^2 + (y-0)^2 = (10)^2$

O – centre ;

slope of $OB = \frac{8}{6} = \frac{4}{3}$

slope of $OC = \frac{6}{-8} = -\frac{3}{4}$

$\alpha = 90^\circ$

$\frac{\alpha}{2} = 45^\circ$ $(\pi/4)$

$2\pi - \alpha = 270^\circ$

$\frac{2\pi - \alpha}{2} = 135^\circ \left(\frac{3\pi}{4}\right)$

What are the coordinates of $A$?

(a) $(-6, 8)$

(b) $(-6, -8)$

(c) $(5\sqrt{2}, 5\sqrt{2})$

(d) Cannot be determined due to insufficient data

What is the equation to the straight line joining the origin to the point of intersection of the lines $\frac{x}{a}+\frac{y}{b}=1$ and $\frac{x}{b}+\frac{y}{a}=1$?

(a) $x+y=0$ (b) $x+y+1=0$

(c) $x-y=0$ (d) $x+y+2=0$

$bx + ay = ab$

$ax + by = ab$

$(b-a)x + (a-b)y = 0 \rightarrow y = x$

$(b+a)x + (a+b)y = 2ab$

$x + y = \frac{2ab}{a+b}$

$2x = \frac{2ab}{a+b} \Rightarrow x = \frac{ab}{a+b} = y$

Line

$(0,0)$ $\left(\frac{ab}{a+b}, \frac{ab}{a+b}\right)$

$y - 0 = 1(x-0)$

$y = x \Rightarrow y - x = 0 \Rightarrow x - y = 0$

The value of $k$ for which the lines $2x + 3y + a = 0$ and $5x + ky + a = 0$ represent family of parallel lines is

(a) 3 (b) 4.5

(c) 7.5 (d) 15

$a_1x + b_1y + c_1 = 0$

$a_2x + b_2y + c_2 = 0$

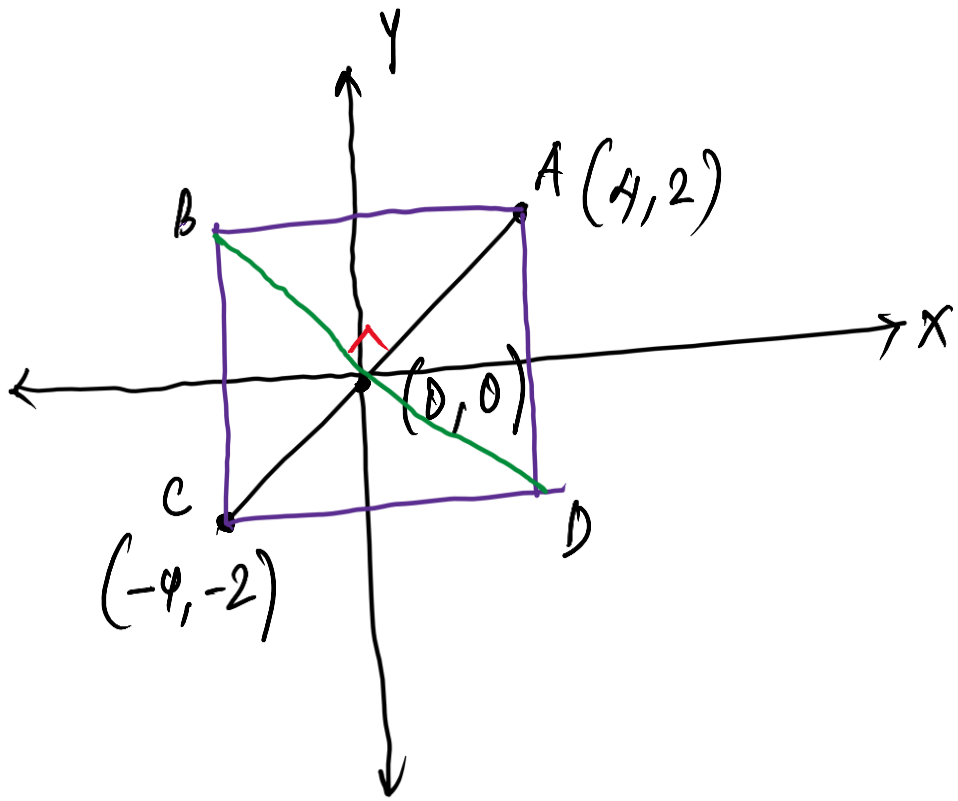
} if lines are parallel $\longrightarrow \frac{a_1}{a_2} = \frac{b_1}{b_2}$

$\frac{2}{5} = \frac{3}{k} \Rightarrow 2k = 15 \Rightarrow k = 7.5$

The point of intersection of diagonals of a square $ABCD$ is at the origin and one of its vertices is at $A(4, 2)$. What is the equation of the diagonal $BD$?

(a) $2x + y = 0$ ✓ (b) $2x - y = 0$

(c) $x + 2y = 0$ (d) $x - 2y = 0$




passing point ⟶ (0,0)

slope of AC = $\frac{2+2}{4+4} = \frac{4}{8} = \frac{1}{2}$

slope of BD = $-2$

$y - 0 = -2(x - 0)$

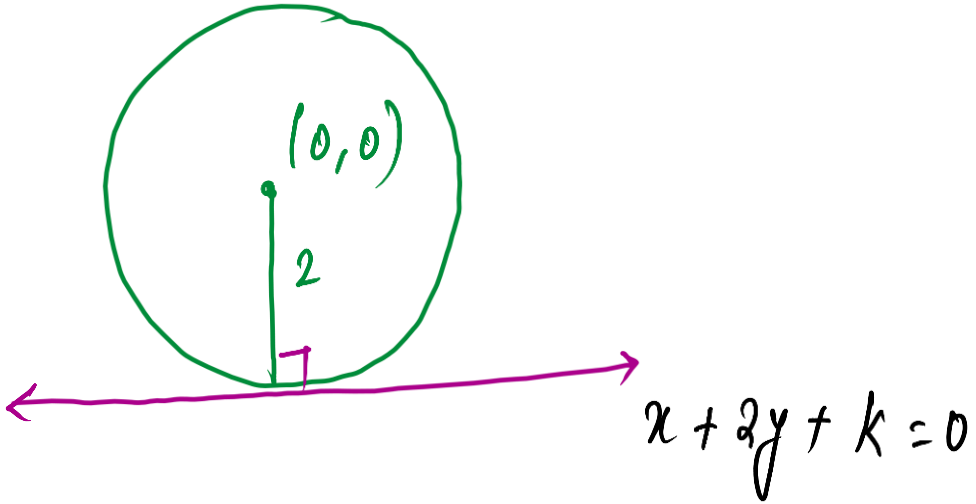
$y + 2x = 0$

$2x + y = 0$

The equation of the tangents to the circle $x^2 + y^2 = 4$, which are parallel to $x + 2y + 3 = 0$, are

(a) $x - 2y = 2$ (b) $x + 2y = \pm 2\sqrt{3}$

(c) $x + 2y = \pm 2\sqrt{5}$ ✓ (d) $x - 2y = \pm 2\sqrt{5}$




Radius = distance of (0,0) from tangent

A line parallel to $ax+by+c=0$, will have eqn, $ax+by+k=0$

only constant will change

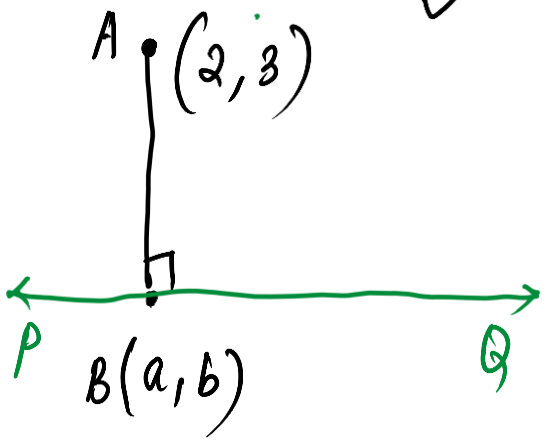
$$2 = \frac{|0+0+k|}{\sqrt{1^2+2^2}}$$

$$2\sqrt{5} = |k| \Rightarrow k = 2\sqrt{5}, -2\sqrt{5}$$

$$x + 2y = \pm 2\sqrt{5}$$

What are the coordinates of the foot of the perpendicular from the point (2, 3) on the line $x + y - 11 = 0$?

(a) (2, 9) (b) (5, 6) (c) (– 5, 6) (d) (6, 5)




$x+y-11=0 \longrightarrow$ slope $= -1$ (PQ)

Slope of AB $= 1$

$$\frac{3-b}{2-a} = 1 \Rightarrow 3-b = 2-a$$

$$a-b = -1 \quad \text{—— (1)}$$

(a, b) lies on PQ,

$$a+b-11 = 0$$

$$a+b = 11 \quad \text{—— (2)}$$

Solve (1) and (2),

$2a = 10$ | $2b = 12$

$a = 5$ | $b = 6$

(5, 6)

What is the locus of the point of intersection of the straight lines $(x/a) + (y/b) = m$ and $(x/a) - (y/b) = 1/m$ ?

(a) Circle (b) Parabola

(c) Ellipse (d) Hyperbola

$$\frac{x}{a} + \frac{y}{b} = m \quad -(1) \qquad \frac{x}{a} - \frac{y}{b} = \frac{1}{m} \quad -(2)$$

(1) x (2),

$$\left(\frac{x}{a} + \frac{y}{b}\right)\left(\frac{x}{a} - \frac{y}{b}\right) = m \times \frac{1}{m}$$

$$\left(\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1\right)$$

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## ANALYTICAL GEOMETRY 3D

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