NDA 1 2025

LIVE

MATHS

ANALYTICAL GEOMETRY 2D

CLASS 4

NAVJYOTI SIR

Crack
EXAMS

24 Oct 2024 Live Classes Schedule

8:00AM	24 OCTOBER 2024 DAILY CURRENT AFFAIRS	RUBY MA'AM
9:00AM	24 OCTOBER 2024 DAILY DEFENCE UPDATES	DIVYANSHU SIR

NDA 1 2025 LIVE CLASSES

11:30AM	GK - POLITY - JUDICIARY	RUBY MA'AM
1:00PM	CHEMISTRY - PREPARATION & PROPERTIES	SHIVANGI MA'AM
4:00PM	MATHS - ANALYTICAL GEOMETRY 2D - CLASS 4	NAVJYOTI SIR
5:30PM	ENGLISH - USE OF PHRASAL VERBS - CLASS 1	ANURADHA MA'AM

CDS 1 2025 LIVE CLASSES

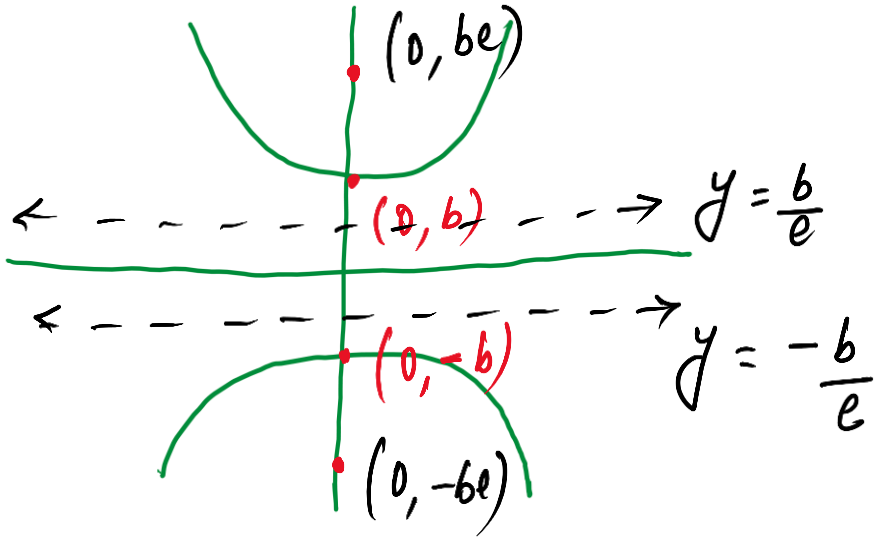
11:30AM	GK - POLITY - JUDICIARY	RUBY MA'AM
1:00PM	CHEMISTRY - PREPARATION & PROPERTIES	SHIVANGI MA'AM
5:30PM	ENGLISH - USE OF PHRASAL VERBS - CLASS 1	ANURADHA MA'AM
7:00PM	MATHS - NUMBER SYSTEM - CLASS 5	NAVJYOTI SIR

AFCAT 1 2025 LIVE CLASSES

4:00PM	STATIC GK - HISTORY - CLASS 2	DIVYANSHU SIR
7:00PM	MATHS - NUMBER SYSTEM - CLASS 5	NAVJYOTI SIR

HYPERBOLA

Conjugate Hyperbola



$$\frac{x^2}{a^2} - \frac{y^2}{b^2} = -1$$

Latus rectum $= \frac{2a^2}{b}$

Relation b/w a, b and e $\longrightarrow$ $e^2 = 1 + \frac{(a^2)}{b^2} = \frac{a^2+b^2}{b^2}$

If the equation of the hyperbola is $9y^2 - 4x^2 = 36$, then

I. the coordinates of foci are $(0, \pm\sqrt{13})$ ✓ $\longrightarrow$ $(0, \pm be) \longrightarrow (0, \pm\sqrt{13})$

II. the eccentricity is $\frac{2}{\sqrt{13}}$. ✗

III. the length of the latus rectum is 8. ✗

$9y^2 - 4x^2 = 36$

$\frac{y^2}{\left(\frac{36}{9}\right)} - \frac{x^2}{\left(\frac{36}{4}\right)} = 1 \Rightarrow \frac{x^2}{9} - \frac{y^2}{4} = -1$

$a^2 = 9 \; ; \; b^2 = 4$

$b = 2$

$e^2 = \frac{a^2 + b^2}{b^2}$

$e^2 = \frac{9+4}{4} = \frac{13}{4}$

$\left(e = \frac{\sqrt{13}}{2}\right)$

$be = \frac{2 \times \sqrt{13}}{2} = \sqrt{13}$

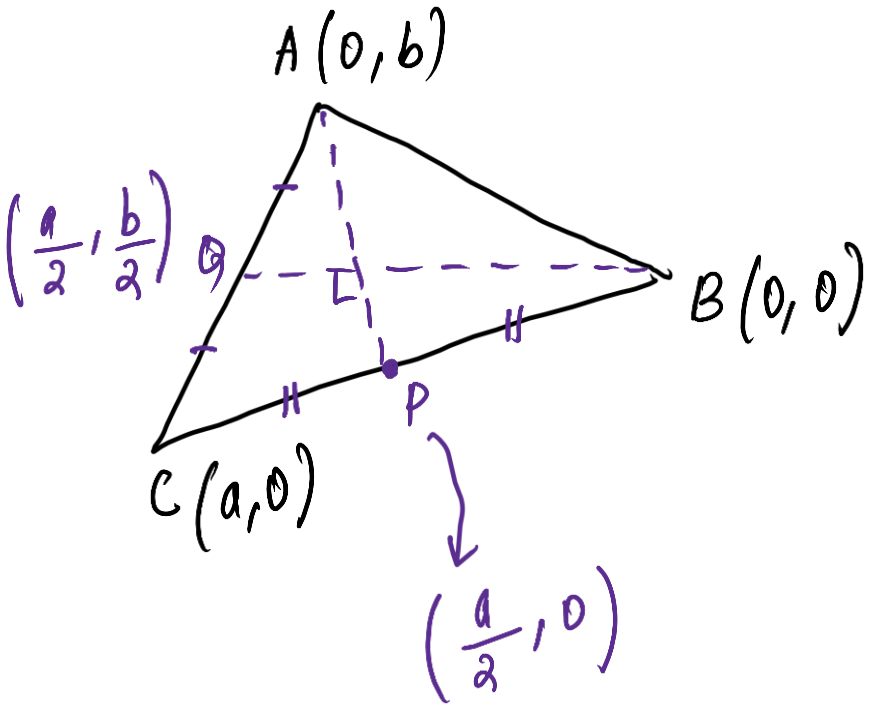
Latus rectum $\longrightarrow \frac{2a^2}{b}$

$= \frac{2(9)}{2} = 9$

If the medians from A and B of the triangle with vertices A (0, b), B (0, 0) and C (a, 0) are mutually perpendicular then

(a) $a^2 = b^2$ (b) $a^2 = 2b^2$

(c) $a^2 = 4b^2$ (d) $2a^2 = b^2$



slope of AP $(m_1) = \frac{0-b}{\frac{a}{2}-0} = -\frac{2b}{a}$

slope of BQ $(m_2) = \frac{b/2-0}{a/2-0} = \frac{b}{a}$

As $AP \perp BQ$,

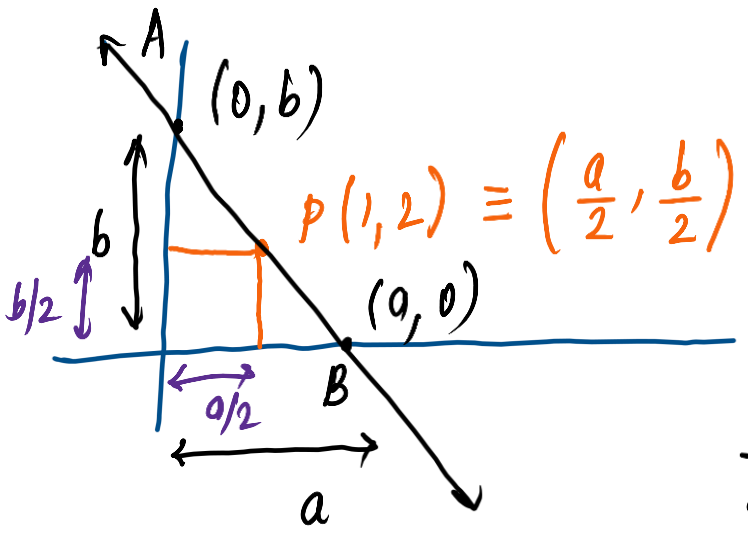
$m_1 \cdot m_2 = -1 \Rightarrow \left(-\frac{2b}{a}\right)\left(\frac{b}{a}\right) = -1$

$2b^2 = a^2$

A line passes through $P(1, 2)$ such that its intercept between the axes is bisected at P. The equation of the line is

(a) $x+2y=5$ (b) $x-y+1=0$

(c) $x+y-3=0$ (d) $2x+y-4=0$ ✓



$P(1,2) \equiv \left(\frac{a}{2}, \frac{b}{2}\right)$ {P acts as mid point of AB)

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

$a = 2 \quad b = 4$

$\frac{x}{2} + \frac{y}{4} = 1$

$2x + y = 4$

$2x + y - 4 = 0$

If the coordinates of the points A and B be (3, 3) and (7, 6), then the length of the portion of the line AB intercepted between the axes is

(a) $\frac{5}{4}$ ✓

(b) $\frac{\sqrt{10}}{4}$

(c) $\frac{\sqrt{13}}{3}$

(d) None of these

eqn of AB

$$y-3 = \frac{3-6}{3-7}(x-3)$$

$$y-3 = \frac{-3}{-4}(x-3) \Rightarrow 4y-12 = 3x-9$$

$$3x-4y+3=0$$

$$3x-4y=-3$$

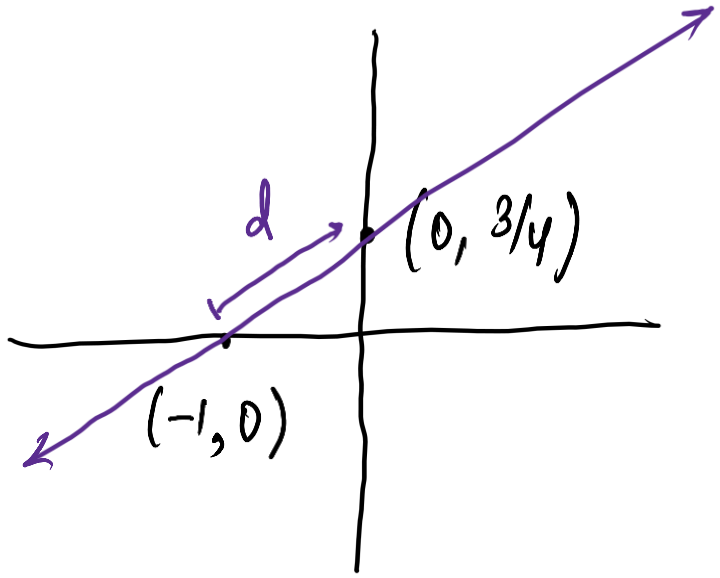
$$\frac{x}{\left(\frac{-3}{3}\right)} + \frac{y}{\left(\frac{-3}{-4}\right)} = 1$$

(of the form $\frac{x}{a}+\frac{y}{b}=1$)

intercepts on axes

$a=-1$

$b=\frac{3}{4}$

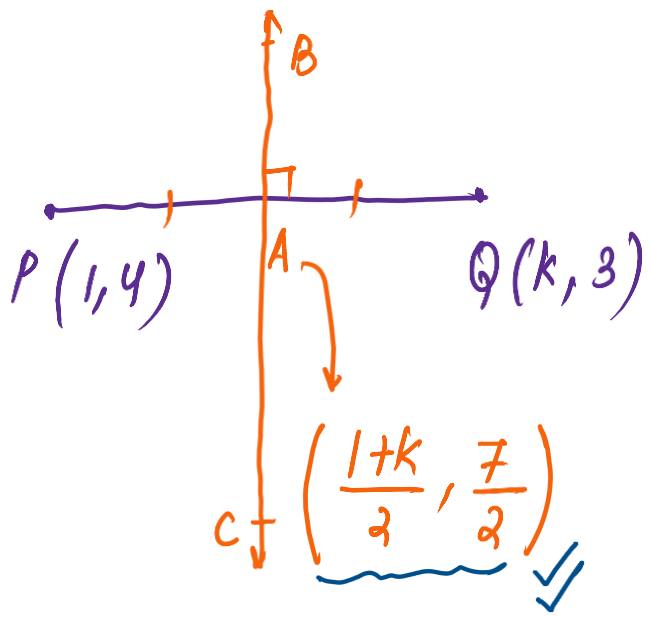


distance $d = \sqrt{\left(\frac{3}{4}\right)^2 + (-1)^2}$

$= \sqrt{\frac{25}{16}} = \frac{5}{4}$

Q) The perpendicular bisector of the line segment joining P (1, 4) and Q(k, 3) has y-intercept –4. Then a possible value of k is

(a) 1 (b) 2 (c) –2 (d) –4 ✓



Slope of PQ $= \frac{3-4}{k-1} = \frac{-1}{k-1}$

Slope of BAC $= (k-1)$ {negative reciprocal}

eqn of BAC $\Rightarrow$ $y = (k-1)x - 4$

$$y = (k-1)x - 4$$

A is on this line (perp. bisector)

$$\frac{7}{2} = (k-1)\left(\frac{1+k}{2}\right) - 4$$

$$7 = -(1-k^2) - 8$$

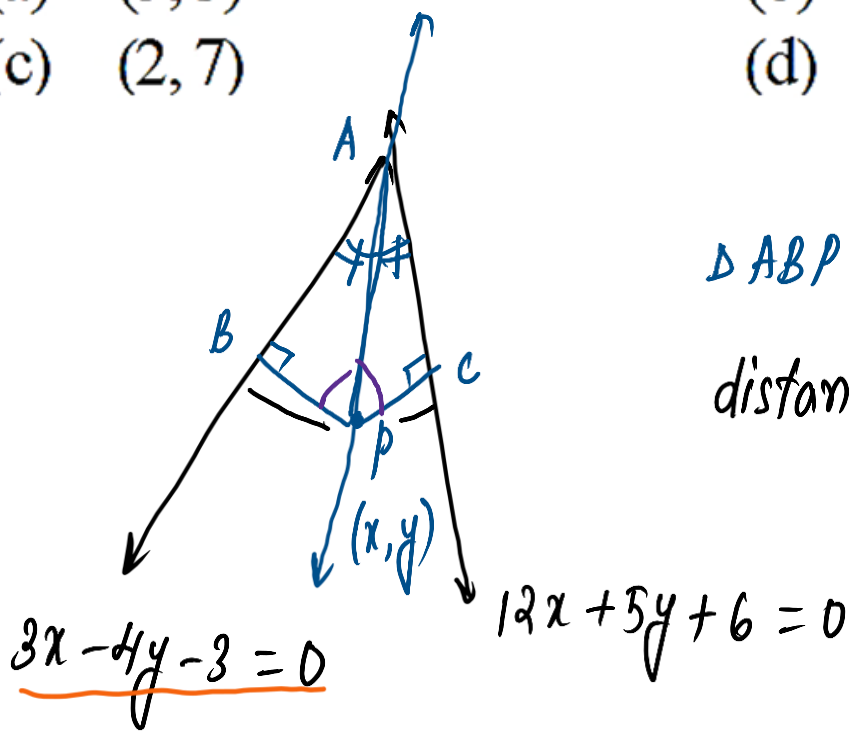
$$15 = k^2 - 1$$

$$k^2 = 16 \longrightarrow k = \pm 4$$

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) $(-1, 4)$



$\triangle ABP \cong \triangle ACP$ (ASA) $\longrightarrow$ $BP = CP$

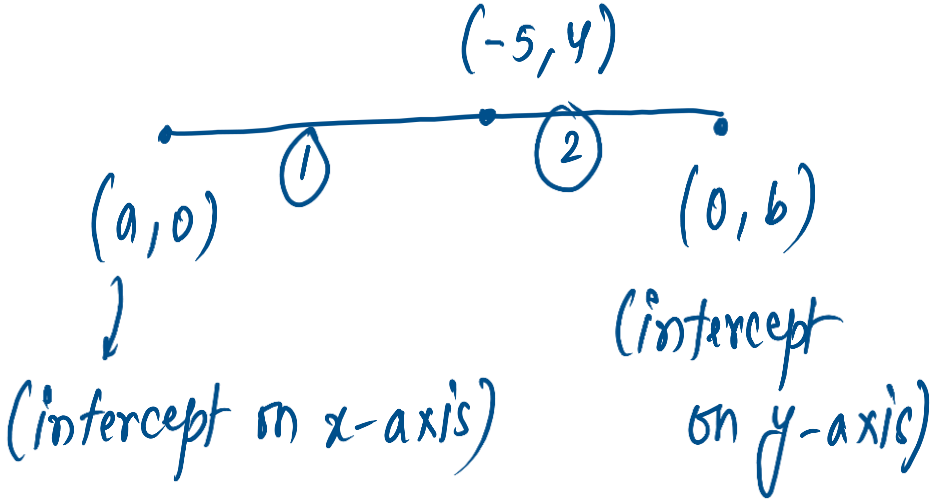
distance of P from both lines will be equal.

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

Q) If $(-5, 4)$ divides the line segment between the coordinate axes in the ratio $1:2$, then what is its equation?

(a) $8x+5y+20=0$ (b) $5x+8y-7=0$

(c) $8x-5y+60=0$ (d) $5x-8y+57=0$



$$-5 = \frac{1\times 0 + 2\times a}{3}$$

$$4 = \frac{1\times b + 2\times 0}{3}$$

$$\frac{-15}{2} = a$$

$$12 = b$$

$$\frac{x}{\left(\frac{-15}{2}\right)} + \frac{y}{12} = 1$$

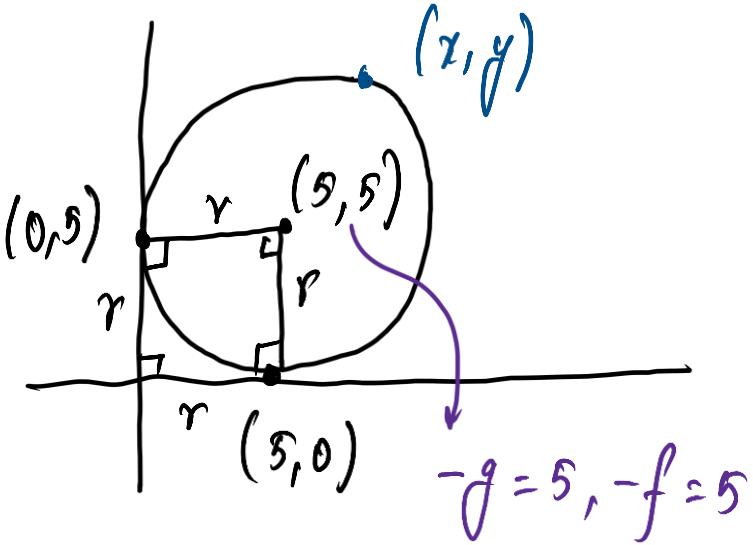
$$-8x + 5y - 60 = 0$$

$$8x - 5y + 60 = 0$$

Q) The equation of the circle which touches the axes at a distance 5 from the origin is $y^2 + x^2 - 2\alpha x - 2\alpha y + \alpha^2 = 0$. What is the value of α?

(a) 4 (b) 5

(c) 6 (d) 7



$x^2 + y^2 - 2\alpha x - 2\alpha y + \alpha^2 = 0$

$(x^2 + y^2 + 2gx + 2fy + c = 0)$

$g = -\alpha$

$-5 = -\alpha$

$\alpha = 5$

Q) What does the equation $x^3y + xy^3 - xy = 0$ represent?

(a) A pair of straight lines only
(b) A pair of straight lines and a circle ✓
(c) A rectangular hyperbola only
(d) A rectangular hyperbola and a circle

$x^3y + xy^3 - xy = 0$

$xy(x^2 + y^2 - 1) = 0$

$xy = 0$ | $x^2 + y^2 - 1 = 0$

$x^2 + y^2 = 1$ → circle

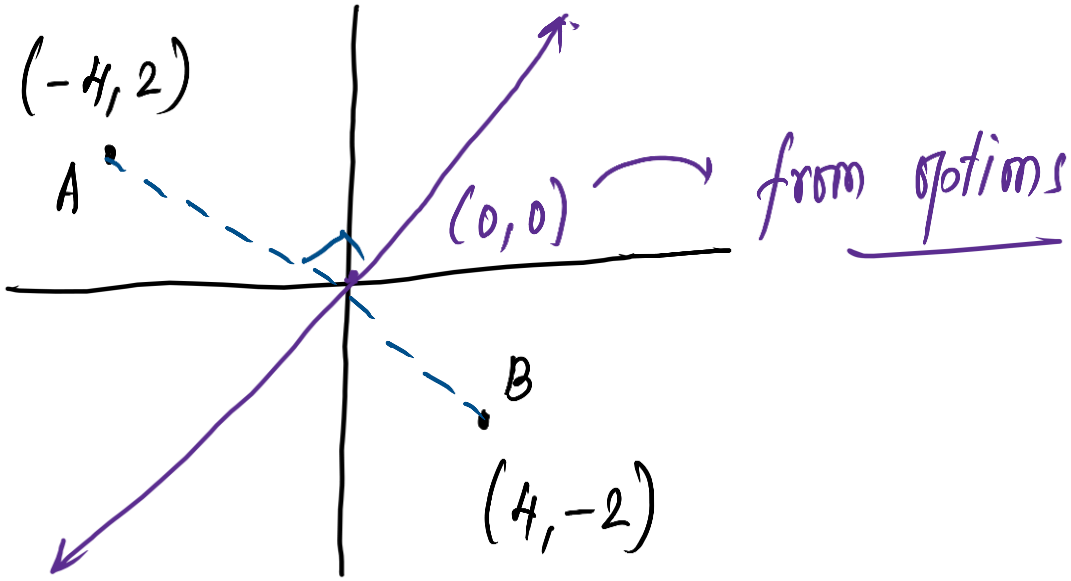
$xy = 0$

(pair of straight lines)

Q) If the image of the point $(-4, 2)$ by a line mirror is $(4, -2)$, then what is the equation of the line mirror?

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

(c) $4y = x$ (d) $y = 4x$



from options

(a) slope = 1

(b) slope = 2

(c) slope = $\frac{1}{4}$

(d) slope = 4

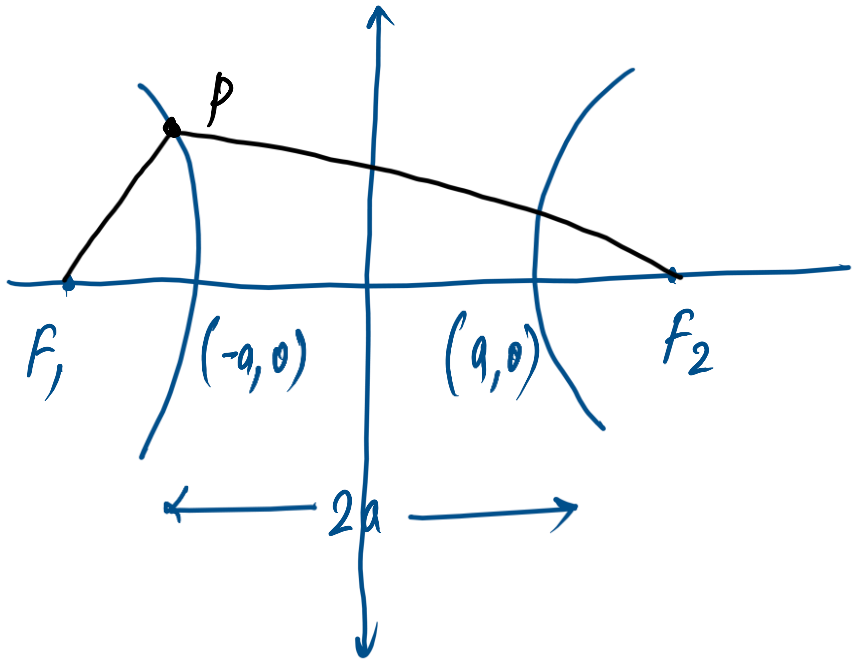
$y = mx + c$

Slope of AB $= \frac{-2-2}{4+4} = \frac{-4}{8} = -\frac{1}{2}$

slope of reqd. line = 2 (negative reciprocal)

Q) The difference of focal distances of any point on a hyperbola is equal to

(a) latus rectum
(b) semi-transverse axis
(c) transverse axis
(d) semi-latus rectum



$PF_2 - PF_1 = 2a$ (length of transverse axis)

Q) The two parabolas $y^2 = 4ax$ and $x^2 = 4ay$ intersect

(a) at two points on the line $y = x$ ✓

(b) only at the origin ✗

(c) at three points one of which lies on $y + x = 0$

(d) only at (4a, 4a)

$y^2 = 4ax$

$\left(\frac{x^2}{4a}\right)^2 = 4ax$

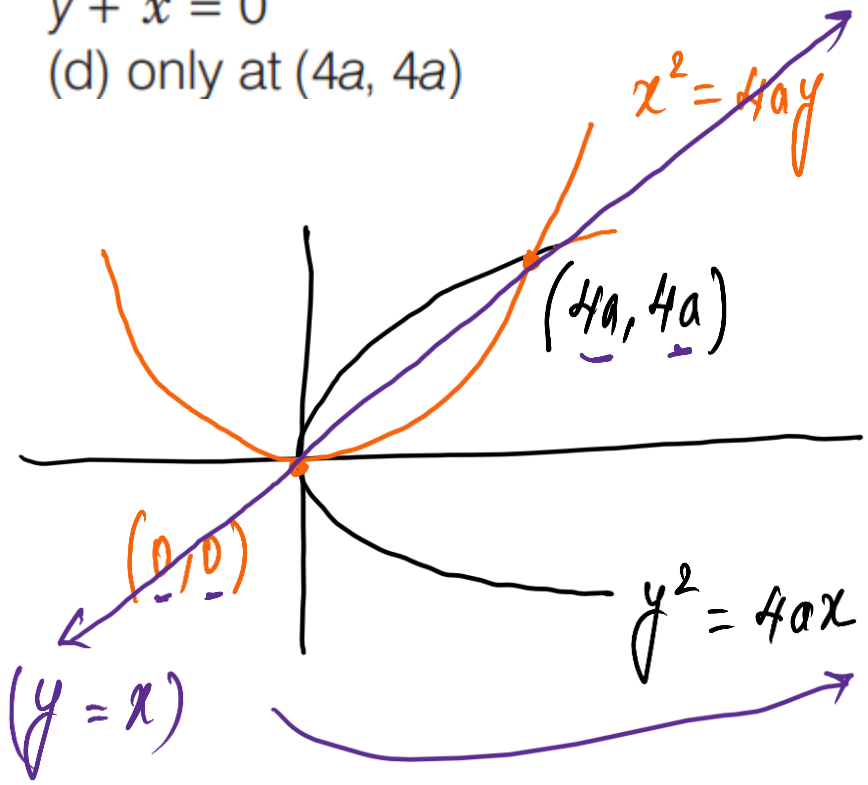
$x^4 = 64a^3 \cdot x$

$x^3 = 64a^3$

$x = 4a$

$y^2 = 16a^2$

$y = 4a$



$y - 0 = \left(\frac{4a-0}{4a-0}\right)(x-0)$

$(y = x)$

Q) If A, B and C are in AP, then the straight line $Ax + 2By + C = 0$ will always pass through a fixed point. The fixed point is

(a) (0, 0) (b) (– 1, 1)

(c) (1, – 2) (d) (1, – 1) ✓

A, B, C

$2B = A + C$

$B - A = C - B$

$A - 2B + C = 0$ — (1)

$Ax + 2By + C = 0$ — (2)

Comparing (1) and (2),

$x = 1, y = -1$

$(1, -1)$

Q) What is the locus of the point of intersection of the straight line $x\cos\theta + y\sin\theta = a$ and the straight line $x\sin\theta - y\cos\theta = b$?

(a) A circle ✓
(b) An ellipse
(c) A hyperbola
(d) A parabola

$$x^2\cos^2\theta + y^2\sin^2\theta + 2xy\sin\theta\cos\theta$$

$$+ x^2\sin^2\theta + y^2\cos^2\theta - 2xy\sin\theta\cos\theta = a^2 + b^2$$

$$x^2 + y^2 = a^2 + b^2$$

$$x^2 + y^2 = r^2$$

eqn of circle

Q) What is the acute angle between the lines $Ax + By = A + B$ and $A(x - y) + B(x + y) = 2B$?

(a) $45°$

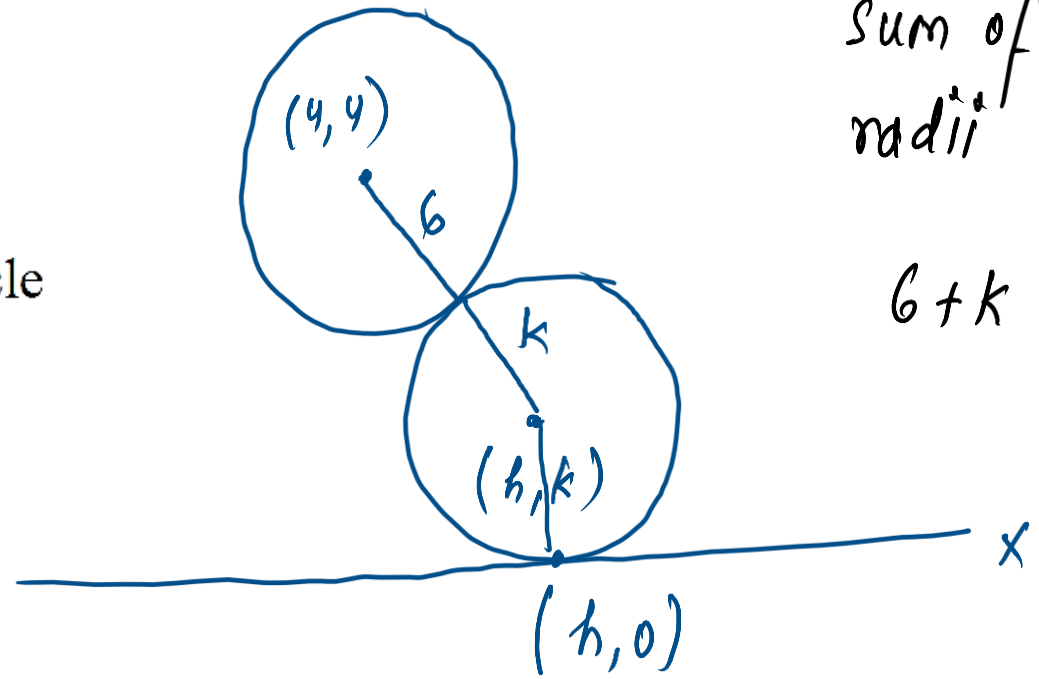
(b) $\tan^{-1}\left(\frac{A}{\sqrt{A^2 + B^2}}\right)$

(c) $\tan^{-1}\left(\frac{B}{\sqrt{A^2 + B^2}}\right)$

(d) $60°$

Q) The centres of those circles which touch the circle,
$x^2 + y^2 - 8x - 8y - 4 = 0$, externally and also touch the x-axis,
lie on:

(a) a hyperbola
(b) a parabola
(c) a circle
(d) an ellipse which is not a circle



Sum of radii = distance between centres

$$6 + k = \sqrt{(4-h)^2 + (4-k)^2}$$

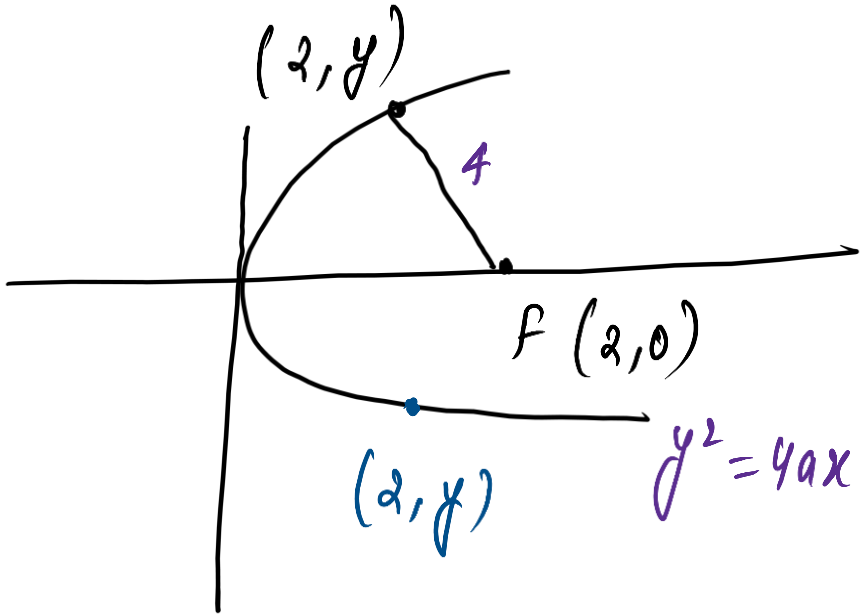
The focal distance of a point on the parabola $y^2 = 8x$ is 4.

Its ordinates are:

(a) ± 1 (b) ± 2 (c) ± 3 (d) ± 4

$y^2 = 4ax$

$a = 2$



focal distance $= x + a$

$\Rightarrow x + a = 4$

$x + 2 = 4$

$x = 2$

$(2-2)^2 + y^2 = (4)^2$

$y^2 = 16 \Rightarrow y = \pm 4$

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