PAIR OF STRAIGHT LINES (1)

Class: IX Mathematics

F^+

SOLUTIONS

Teaching Task

01. Given eqn of pair of lines

$$x^2+xy-2y^2-5x+2y-4=0$$

$$ax^2+2hxy+by^2+2gx+2fy+c=0$$

$a=1 \mid h=\frac{1}{2} \mid b=-2 \mid g=-\frac{5}{2} \mid f=1 \mid c=-4$

$$P.I = \left(\frac{hf-bg}{ab-h^2}, \frac{gh-af}{ab-h^2}\right)$$

$$= \left(\frac{\frac{1}{2}\cdot 1+2\cdot\left(-\frac{5}{2}\right)}{1\cdot(-2)-\left(\frac{1}{2}\right)^2}, \frac{\left(-\frac{5}{2}\right)\left(\frac{1}{2}\right)-1\cdot 1}{1\cdot(-2)-\left(\frac{1}{2}\right)^2}\right)$$

$$= \left(\frac{\frac{1}{2}-5}{-2-\frac{1}{4}}, \frac{-\frac{5}{4}-1}{-2-\frac{1}{4}}\right)$$

$$= \left(\frac{-\frac{9}{2}}{-\frac{9}{4}}, \frac{-\frac{9}{4}}{-\frac{9}{4}}\right)$$

$$= (2, 1)$$

Ans: D

02. $\lambda x^2-5xy+6y^2+x-3y=0$

$a=\lambda,\ b=6,\ h=-\frac{5}{2},\ g=\frac{1}{2},\ f=-\frac{3}{2},\ c=0$

$\Delta = abc+2fgh-af^2-bg^2-ch^2=0$

$\Rightarrow \boxed{x=1}$

$\therefore x^2-5xy+6y^2+x-3y=0$

$$P.I = \left(\frac{hf-bg}{ab-h^2}, \frac{gh-af}{ab-h^2}\right)$$

$$=(-3,-1)$$

Ans: A

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03. The point of Intersection (P.I)

$$ax^2+3xy-2y^2-5x+5y+c=0$$

$\perp r$ lines $\Rightarrow a+b=0$

$a-2=0$

$\Rightarrow \boxed{a=2}$

$$\Delta = abc+2fgh-af^2-bg^2-ch^2=0$$

$$\boxed{c=-3}$$

$$P.I = \left(\frac{hf-bg}{ab-h^2}, \frac{gh-af}{ab-h^2}\right)$$

$$=\left(\frac{-1}{5}, \frac{-7}{5}\right)$$

Ans: C

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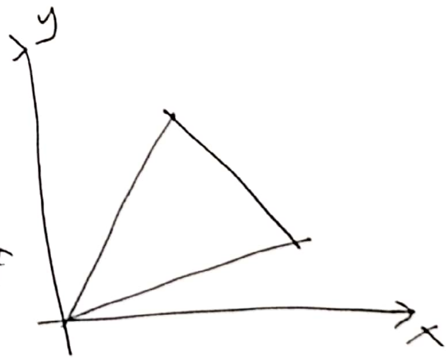
04. $11x^2+16xy-y^2=0$

$ax^2+2hxy+by^2=0$

$a=11,\quad h=8,\quad b=-1$



If $lx+my+n=0$ is one side of an equilateral $\triangle$le, then the pair of other two sides are

$$(lx+my)^2-3(mx-ly)^2=0$$

Given $\quad x-2y+13=0 \quad \Big| \; l=1, \; m=-2, \; n=13$

$\quad lx+my+n=0$

$$(x-2y)^2-3(-2x-y)^2=0$$

$= (x^2 - 4xy + 4y^2) - 3(4x^2 + 4xy + y^2) = 0$

$\Rightarrow x^2 - 4xy + 4y^2 - 12x^2 - 12xy - 3y^2 = 0$

$= -11x^2 - 16xy + y^2 = 0$

$\Rightarrow 11x^2 + 16xy - y^2 = 0.$

which is given, hence the given pair of lines, represent the equilateral Δle.

Ans: A

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05. $2x^2 + 3xy - 2y^2 = 0$

$a = 2, \quad b = -2 \Rightarrow a + b = 0.$

Hence, it is a right angled Δle.

Now $\quad 2x^2 + 3xy - 2y^2 = 0$

$\Rightarrow \underline{2x^2 + 4xy} \; \underline{- xy - 2y^2} = 0$

$\Rightarrow 2x(x + 2y) - y(x + 2y) = 0$

$\Rightarrow (x + 2y)(2x - y) = 0$

$\Rightarrow x + 2y = 0 \quad \& \quad 2x - y = 0$

Now Angle b/w $x + 2y = 0$ and $3x + y + 1 = 0.$

$$\cos\theta = \frac{|a_1a_2 + b_1b_2|}{\sqrt{a_1^2 + b_1^2} \cdot \sqrt{a_2^2 + b_2^2}}$$

$$= \frac{|1 \cdot 3 + 2 \cdot 1|}{\sqrt{1+4} \cdot \sqrt{9+1}} = \frac{5}{\sqrt{5} \cdot \sqrt{10}} = \frac{1}{\sqrt{2}}$$

$\therefore \theta = 45^\circ.$

Hence, it is right angled isosceles triangle

Ans: C

06

06. Slope of $x+3y=1$ is $-\frac{1}{3}$

slope of $\perp$r lines is 3.

Eqn of the line passing through origin having slope 3 is $y=3x$

Now $9x^2-12xy+ky^2=0$

$9x^2-12x(3x)+k(3x)^2=0$

$\Rightarrow k=3$

Ans: A

07. $(-2,3)$, $x^2-y^2+2x+1=0$

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

product of $\perp$r $= \dfrac{|(-2)^2-3^2+2(-2)+1|}{\sqrt{(1+1)^2+4\cdot(\frac{1}{2})^2}}$

$= \dfrac{|4-9-4+1|}{\sqrt{4+1}} = \dfrac{8}{\sqrt{5}}$

Ans: –

08. $6x^2-5xy+6y^2+14x+16y+14=0$

$d = \dfrac{|c|}{\sqrt{(a-b)^2+4h^2}}$

$= \dfrac{|14|}{\sqrt{(6-6)^2+4(-\frac{5}{2})^2}} = \dfrac{14}{\sqrt{25}} = \dfrac{14}{5}$

Ans: B

09. $(f,-g)$, $hxy+gx+fy+c=0$

$d = \dfrac{|h.f(-g)+gf+f(-g)+c|}{\sqrt{(0-0)^2+4(\frac{h}{2})^2}} = \dfrac{|-fgh+c|}{|h|}$

$= \left|\dfrac{fgh-c}{h}\right|$

Ans: D

10. $$d = \frac{|2|}{\sqrt{(12-12)^2 + 4\left(\frac{25}{2}\right)^2}} = \frac{2}{25}$$ Ans. B

11. $x^2 - y^2 = 0$

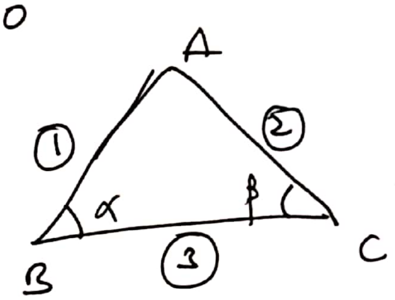
$(x+y)(x-y) = 0$

$x+y=0$ & $x-y=0$

$\downarrow$ ① $\downarrow$ ②

$kx + 2y - 1 = 0$

$\downarrow$ ③



Angle b/w ① & ③

$$\cos\alpha = \frac{|1\cdot k + 1\cdot 2|}{\sqrt{1+1}\cdot\sqrt{k^2+1}} = \frac{|k+2|}{\sqrt{2}\cdot\sqrt{k^2+1}}$$

Angle b/w ② & ③

$$\cos\beta = \frac{|1\cdot k - 1\cdot 2|}{\sqrt{1+1}\cdot\sqrt{k^2+1}} = \frac{|k-2|}{\sqrt{2}\cdot\sqrt{k^2+1}}$$

We have $$\frac{|k+2|}{\sqrt{2}\cdot\sqrt{k^2+1}} = \frac{|k-2|}{\sqrt{2}\cdot\sqrt{k^2+1}}$$

Possible only when $k=0$ Ans: D

12. $$1 = \frac{|a+2h+b|}{\sqrt{(a-b)^2+4h^2}}$$

S.O.B.S

$(a-b)^2 + 4h^2 = (a+2h+b)^2$

$\Rightarrow \cancel{a^2 - 2ab + b^2 + 4h^2 = a^2 + 4h^2 +}$

$\Rightarrow (a-b)^2 + \cancel{4h^2} = (a+b)^2 + \cancel{4h^2} + 2(a+b)2h$

$\Rightarrow -4ab = 4(a+b)h \Rightarrow h(a+b) + ab = 0$

Ans: C

13. <u>Statement I</u> $x^2 - y^2 - 2x + 2y = 0$

c~~learly (1,1)~~).

$a = 1$ | $h = 0$
$b = -1$ | $g = -1$
$c = 0$ | $f = -1$

$\therefore \quad P \cdot I = \left(\dfrac{hf - bg}{ab - h^2}, \dfrac{gh - af}{ab - h^2} \right) = (1,1).$

Given $2x^2 - 5xy + 2y^2 + x + y - 1 = 0$

$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$

$a = 2$ | $h = -\frac{5}{2}$
$b = 2$ | $g = \frac{1}{2}$
$c = -1$ | $f = \frac{1}{2}$

$$P \cdot I = \left(\frac{hf - bg}{ab - h^2}, \frac{gh - af}{ab - h^2} \right)$$

$$= \left(\frac{-\frac{5}{2} \cdot \frac{1}{2} - 2 \cdot \frac{1}{2}}{2 \cdot 2 - \left(-\frac{5}{2}\right)^2}, \frac{\frac{1}{2}\left(\frac{-5}{2}\right) - 2 \cdot \frac{1}{2}}{2 \cdot 2 - \left(-\frac{5}{2}\right)^2} \right)$$

$$= \left(\frac{-\frac{5}{4} - 1}{4 - \frac{25}{4}}, \frac{-\frac{5}{4} - 1}{4 - \frac{25}{4}} \right)$$

$$= \left(\frac{-9}{-9}, \frac{-9}{-9} \right) = (1,1)$$

Hence, the distance b/w the points of intersection is zero

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Statement II: Conceptual (True) Ans: A

14. Statement I:

$2h = 4$
$h = 2$

$$d = \frac{|1|}{\sqrt{(2+6)^2 + 4\left(\frac{2}{\cancel{8}}\right)^2}} = \frac{1}{\sqrt{64+16}}$$

$$= \frac{1}{\sqrt{80}} \quad \text{(True)}$$

Statement II: Conceptual (True) Ans: A

15. Formula - $\dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

$$= \frac{1(5+2) - (-1)^2 - (-1)^2}{5 \cdot 2 - 1^2}$$

$$= \frac{7 - 1 - 1}{10 - 1} = \frac{5}{9}$$

Ans: C

16. formula = $\dfrac{c(a+b) - f^2 - g^2}{ab - h}$

$$= \frac{5(3+1) - 2^2 - 2^2}{3 \cdot 1 - 1^2}$$

$$= \frac{20 - 4 - 4}{3 - 1} = \frac{12}{2} = 6$$

Ans: A

17. $$D = \frac{|2(-1)^2 - 5(-1)(2) + 2(2)^2|}{\sqrt{(2-2)^2 + 4\left(-\frac{5}{2}\right)^2}}$$

$$= \frac{|2 + 10 + 8|}{5} = \frac{20}{5} = 4$$

Ans: A

9

16

Ans : t, p, q, —

$\frac{f^2-g^2}{\ldots - h^2}$

$\frac{\ldots 1) - (1)^2 - 0^2}{\ldots(-1) - 0^2}$

$\frac{-1}{-1} = 1$

$+10y^2 - 7x + 13y + k = 0$

$-\frac{11}{2}$

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

$f = \frac{13}{2}$

$\left(\frac{hf-bg}{ab-h^2}, \frac{gh-af}{ab-h^2}\right) = (3,1)$

...nceptual (0, 0)

...onceptual $k = 3$

Ans : r, p, s, q

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18. $d = \dfrac{|1^2 - 1.1 + 2\cdot 1^2|}{\sqrt{(1-2)^2 + 4(-\frac{1}{2})^2}} = \dfrac{|1-1+2|}{\sqrt{1+1}} = \dfrac{2}{\sqrt{2}} = \sqrt{2}$

Ans: —

19. $d = \dfrac{|2|}{\sqrt{(12-12)^2 + 4\left(\frac{25}{2}\right)^2}} = \dfrac{2}{25} = K$

$\therefore 25K - 2 = 0$

Ans: 0

20 $(x+2a)^2 - 3y^2 = 0$. & $x = a$

These Lines forms an equilateral triangle

~~Ans: 60°~~

Since $ax^2 + 2hxy + by^2 = (lx+my)^2 - 3(mx-ly)^2$

condition satisfies.

Ans. 60°

21 a) $x^2 + 3xy + 2y^2 - 8x - 11y + 15 = 0$

$a = 1$	$g = -4$
$b = 2$	$f = -\frac{11}{2}$
$c = 15$	$h = \frac{3}{2}$

$P.I = \left(\dfrac{hf-bg}{ab-h^2}, \dfrac{gh-af}{ab-h^2}\right) = (1, 2)$

b) $d = \dfrac{|15|}{\sqrt{(1-2)^2 + 4\left(\frac{3}{2}\right)^2}} = \dfrac{15}{\sqrt{1+9}} = \dfrac{15}{\sqrt{10}} \times \dfrac{\sqrt{10}}{\sqrt{10}} = \dfrac{3\sqrt{10}}{2}$

c) $d = \dfrac{|1\cdot 1^2 + 3\cdot 1\cdot 1 + 2\cdot 1^2 - 8\cdot 1 - 11\cdot 1 + 15|}{\sqrt{(1-2)^2 + 4(3/2)^2}}$

$= \dfrac{1}{\sqrt{10}}$

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d) formula $= \dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

$= \dfrac{15(1+2) - \left(\frac{-11}{2}\right)^2 - (-4)^2}{1.2 - \left(\frac{3}{2}\right)^2}$

$= \dfrac{45 - \frac{121}{4} - 16}{2 - \frac{9}{4}}$

$= 5$

Ans: t, p, q, —

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22 a) formula $= \dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

$= \dfrac{-1(1-1) - (1)^2 - 0^2}{1.(-1) - 0^2}$

$= \dfrac{-1}{-1} = 1$

b) $3x^2 - 11xy + 10y^2 - 7x + 13y + k = 0$

$a = 3$ | $h = \frac{-11}{2}$

$b = 10$ | $g = -\frac{7}{2}$

$c = k$ | $f = \frac{13}{2}$

P.I $= \left(\dfrac{hf - bg}{ab - h^2}, \dfrac{gh - af}{ab - h^2}\right) = (3, 1)$

c) conceptual (0,0)

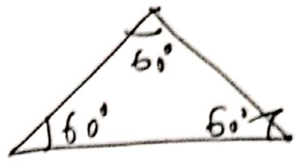
d) Conceptual $k = 3$

Ans: r, p, s, q

LEARNERS TASK

CUQ'S

01. $Ax^2 + 3Hxy + BY^2 = 0$



$\tan\theta = \dfrac{2\sqrt{h^2-ab}}{a+b}$

$\Rightarrow \sqrt{3} = \dfrac{2\sqrt{h^2-ab}}{a+b}$ since $\theta = 60°$

S.O.B.S

$\Rightarrow 4(h^2-ab) = 3(a+b)^2$

$4(h^2-ab) = \frac{3}{9}(a^2+b^2+2ab)$

$\Rightarrow 4h^2 - 4ab = 3a^2+3b^2+6ab$

$\Rightarrow 4h^2 = 3a^2+3b^2+10ab$

$\Rightarrow 4h^2 = (a+3b)(b+3a)$

$\therefore 4H^2 = (A+3B)(B+3A)$ Ans: D

02. Original eqn. $ax^2+2hxy+by^2=0$.

Origin is shifted to (α, β)

transformed eqn is $a(x-\alpha)^2 + 2h(x-\alpha)(y-\beta) + b(y-\beta)^2 = 0$

$\therefore$ Point of intersection (α, β) Ans: B

*03. $P = \dfrac{|h.f.(-g) + \cancel{g.f} + f(\cancel{-g}) + c|}{\sqrt{(0-0)^2 + 4(\frac{h}{2})^2}}$

$= \left|\dfrac{-hfg+c}{h}\right| = \left|\dfrac{fgh-c}{h}\right|$ Ans: D

$$\frac{|1\cdot l + 1\cdot 2|}{\sqrt{1^2+1^2}\cdot\sqrt{l^2+2^2}} = \frac{|1\cdot l - 1\cdot 2|}{\sqrt{1^2+1^2}\cdot\sqrt{l^2+2^2}}$$

$\Rightarrow |l+2| = |l-2|$

$\Rightarrow l = 0$

Ans: D

$$d = \frac{|2|}{\sqrt{(12-12)^2 + 4\left(\frac{25}{2}\right)^2}} = \frac{2}{25}$$

Ans: B

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3. formula $= \dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

$$= \frac{2(12+12) - \left(\frac{11}{2}\right)^2 - (5)^2}{12\cdot 12 - \left(\frac{25}{2}\right)^2}$$

$= \frac{2}{13}$

Ans: ~~B~~D

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04. $xy - x - y + 1 = 0$

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

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

$\Rightarrow (x, y) = (1, 1)$.

Now $a(1) + 2(1) - 3 = 0$

$\Rightarrow a = 1$

Ans: C

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05. $x^2 + py^2 + y - q^2 = 0$

$\perp$r lines $\Rightarrow a + b = 0$

$\Rightarrow 1 + p = 0$

$\Rightarrow p = -1$.

$\therefore x^2 - y^2 + y - q^2 = 0$

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

$b = -1$ $g = 0$

$c = -q$ $h = 0$

Point Intersect $= (0, \frac{1}{2})$

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04. Conceptual (True) Ans: D

05 Conceptual $x = 3$ Ans: C

06. Conceptual Ans.. D

07. formula $= \dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

Since lines are $\perp$ $\Rightarrow$ $a+b=0$

$= \dfrac{-f^2 - g^2}{ab - h^2}$

$= \dfrac{f^2 + \cancel{g}^2}{h^2 - ab}$

$= \dfrac{f^2 + g^2}{h^2 - a(-a)} = \dfrac{f^2+g^2}{h^2+a^2}$ (or) $\dfrac{f^2+g^2}{h^2+b^2}$

Ans. D

08. Conceptual Ans. D

09. Conceptual (Theorem). Ans. A

10. Conceptual (Theorem) Ans. B

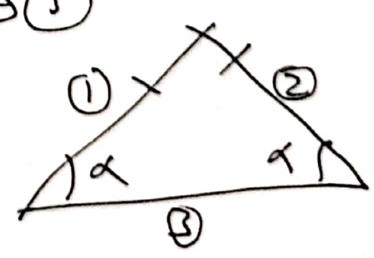
JEE MAINS LEVEL

01. $x^2 - y^2 = 0$

$lx + 2y - 1 = 0 \rightarrow (3)$

$x + y = 0 \rightarrow (1)$

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



$\cos\alpha = \dfrac{|a_1 a_2 + b_1 b_2|}{\sqrt{a_1^2 + b_1^2} \cdot \sqrt{a_2^2 + b_2^2}}$

$$\frac{|1\cdot l + 1\cdot 2|}{\sqrt{1^2+1^2}\cdot\sqrt{l^2+2^2}} = \frac{|1\cdot l - 1\cdot 2|}{\sqrt{1^2+1^2}\cdot\sqrt{l^2+2^2}}$$

$\Rightarrow \quad |l+2| = |l-2|$

$\Rightarrow \quad l = 0$

Ans: D

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02 $$d = \frac{|2|}{\sqrt{(12-12)^2+4\left(\frac{25}{2}\right)^2}} = \frac{2}{25}$$

Ans: B

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03 formula $= \dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

$$= \frac{2(12+12) - \left(\frac{11}{2}\right)^2 - (5)^2}{12\cdot 12 - \left(\frac{25}{2}\right)^2}$$

$$= \cancel{2} \; \frac{2}{13}$$

Ans: ~~B~~D

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04. $xy - x - y + 1 = 0$

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

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

$\Rightarrow (x,y) = (1,1)$.

Now $a(1) + 2(1) - 3 = 0$

$\Rightarrow a = 1$

Ans: C

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05. $x^2 + py^2 + y - q^2 = 0$

$\perp$r lines $\Rightarrow a+b=0$

$\Rightarrow 1+p=0$

$\Rightarrow p=-1$.

$\therefore x^2 - y^2 + y - q^2 = 0$

$a=1$	$f=\frac{1}{2}$
$b=-1$	$g=0$
$c=-q$	$h=0$

Point Intersect $= \left(0, \frac{1}{2}\right)$

Now $x^2 - y^2 + y - q^2 = 0$

$(0, \frac{1}{2}) \Rightarrow 0^2 - (\frac{1}{2})^2 + (\frac{1}{2}) - q^2 = 0$

$\Rightarrow -\frac{1}{4} + \frac{1}{2} - q^2 = 0$

$\Rightarrow \frac{1}{4} - q^2 = 0$

$\Rightarrow q^2 = \frac{1}{4} \Rightarrow q = \pm\frac{1}{2}$

$\therefore$ point of intersection is $(0, q)$ Ans: C

06. $(y^2 - 4xy - x^2)(x + y + 1) = 0$

Consider $y^2 - 4xy - x^2 = 0$

$\Rightarrow x^2 + 4xy - y^2 = 0$

$ax^2 + 2hxy + by^2 = 0$

$a = 1,\ b = -1 \Rightarrow a + b = 0.$

hence, the $\triangle$le is right angled $\triangle$le Ans: B

07. $x^2 - 3y^2 = 0.$ $x = 4. \Rightarrow x - 4 = 0$

$\Rightarrow lx + my + n = 0$

$x^2 - 3y^2 = (x - 4)^2 - 3(0.x - 1.y)^2$

-4

$= (x-4)^2 - 3(4-y)^2$

$= x^2 - 8x$

07. Given pair of lines $x^2 - 3y^2 = 0$

Given line $\left.\begin{array}{l} x - 4 = 0 \\ lx + my + n = 0 \end{array}\right\}$ $l = 1,\ m = 0,\ n = -4$

Now, $x^2 - 3y^2 = (lx + my)^2 - 3(mx - ly)^2$

$= (1.x + 0.y)^2 - 3(0.x - 1.y)^2$

$= x^2 - 3y^2$

Hence it is an equilateral $\triangle$le Ans. D

08. $d = \frac{|2\cdot 0^2 - 5\cdot 0\cdot 1 + 1^2|}{\sqrt{(2-1)^2 + 4\left(-\frac{5}{2}\right)^2}} = \frac{1}{\sqrt{26}}$ Ans: B

09. $d = \frac{|1^2 - 4\cdot 1\cdot K + K^2|}{\sqrt{(1-1)^2 + 4(-2)^2}} = \frac{3}{2}$

$\Rightarrow K = 5$ Ans: B

10. $3x^2 - 11xy + 10y^2 - 7x + 13y + K = 0$

$a = 3$, $b = 10$, $c = K$ | $h = -\frac{11}{2}$, $g = -\frac{7}{2}$, $f = \frac{13}{2}$

$\Delta = abc + 2fgh - af^2 - bg^2 - ch^2 = 0$

point of Intersection $= \left(\frac{hf - bg}{ab - h^2}, \frac{gh - af}{ab - h^2}\right)$

$= \left(\frac{-\frac{11}{2}\cdot\frac{13}{2} - 10\cdot\left(-\frac{7}{2}\right)}{3\cdot 10 - \left(-\frac{11}{2}\right)^2}, \frac{\left(-\frac{7}{2}\right)\left(-\frac{11}{2}\right) - 3\left(\frac{13}{2}\right)}{3\cdot 10 - \left(-\frac{11}{2}\right)^2}\right)$

$= (3, 1)$ Ans: B

11. point of intersection of $x^2 - y^2 - 2x + 2y = 0$ is $(1, 1)$

point of Intersection of $2x^2 - 5xy + 2y^2 + x + y = 0$ i $(1, 1)$ Ans: B

$\therefore$ ~~Hence~~ distance 0

12. $P.I = \left(\frac{hf - bg}{ab - h^2}, \frac{gh - af}{ab - h^2}\right) = (2, 1)$ Ans: B

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13. Statement I: $x^2 - 5xy + 4y^2 + 8x - 11y + 7 = 0$

$P.I = (1, 2)$ (True)

Statement II: Conceptual (True)

Ans: A

14. Statement I:

$$\frac{|k^2 + 4.k.k + 3k^2|}{\sqrt{(1-3)^2 + 4(2)^2}} = \frac{4}{\sqrt{5}}$$

$\Rightarrow k = \pm 1$

Ans: A

Statement II: Conceptual (True)

15. $3x^2 + 7xy + 2y^2 + 5x - 5y + 2 = 0$

$$P.I = \left(\frac{hf-bg}{ab-h^2}, \frac{gh-af}{ab-h^2}\right)$$

$$= \left(\frac{-3}{5}, \frac{-1}{5}\right)$$

Ans: B

16. $2x^2 + 3xy - 2y^2 + 3x - 9y - 9 = 0$

Ans: A

$$P.I = \left(\frac{3}{5}, \frac{-9}{5}\right)$$

17. $$d = \frac{|1|}{\sqrt{(1-1)^2 + 4(-2)^2}} = \frac{1}{4}$$

Ans: D

18. $$\frac{|k|}{\sqrt{(1+3)^2 + 4(3)^2}} = \frac{1}{\sqrt{52}}$$

Ans: D

$\therefore k = \pm 1$

19. $x^2+3xy+2y^2-3x-4y+2=0$

$ax^2+2hxy+by^2+2gx+2fy+c=0$

$a=2 \quad h=\frac{3}{2}$

$b=2 \quad g=-\frac{3}{2}$

$c=2 \quad f=-2$

$P.I=\left(\frac{hf-bg}{ab-h^2}, \frac{gh-af}{ab-h^2}\right)$

$=\left(\frac{\frac{3}{2}(-2)-2\cdot(-\frac{3}{2})}{}\right.$

$=\left(\frac{\frac{3}{2}\cdot(-2)-2\cdot(-\frac{3}{2})}{2\cdot2-(\frac{3}{2})^2}, \frac{(-\frac{3}{2})(\frac{3}{2})-2\cdot(-2)}{2\cdot2-(\frac{3}{2})^2}\right)$

$=\left(\frac{-3+3}{4-\frac{9}{4}}, \frac{-\frac{9}{4}+4}{4-\frac{9}{4}}\right)$

$=\left(0, \frac{7}{7}\right)=(0,1)\rightarrow(\alpha,\beta)$

$2\alpha+\beta=2\cdot0+1=1$

Ans: 1

20. formula $=\frac{c(a+b)-f^2-g^2}{ab-h^2}$

$=\frac{3(1-1)-2^2-(-\frac{3}{2})^2}{1\cdot(-1)-(-3)^2}=$

$=\frac{-4-\frac{9}{4}}{-1-9}=\frac{-25}{4\times-10}=\frac{5}{8}$

$\therefore \frac{3}{\cancel{2}\sqrt{k}}=\frac{5}{8 4} \Rightarrow \sqrt{k}=\frac{12}{5}$

$\Rightarrow k=\frac{144}{25}$

Ans: —

19. $x^2 + 3xy + 2y^2 - 3x - 4y + 2 = 0$

$ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$

$a = 2$, $b = 2$, $c = 2$ | $h = \frac{3}{2}$, $g = -\frac{3}{2}$, $f = -2$

$$P.I = \left(\frac{hf - bg}{ab - h^2}, \frac{gh - af}{ab - h^2}\right)$$

$$= \left(\frac{\frac{3}{2}(-2) - 2\cdot\left(-\frac{3}{2}\right)}{2\cdot 2 - \left(\frac{3}{2}\right)^2}, \frac{\left(-\frac{3}{2}\right)\left(\frac{3}{2}\right) - 2\cdot(-2)}{2\cdot 2 - \left(\frac{3}{2}\right)^2}\right)$$

$$= \left(\frac{-3+3}{4 - \frac{9}{4}}, \frac{-\frac{9}{4} + 4}{4 - \frac{9}{4}}\right)$$

$$= \left(0, \frac{7}{7}\right) = (0, 1) \rightarrow (\alpha, \beta)$$

$2\alpha + \beta = 2\cdot 0 + 1 = 1$

Ans: 1

20. formula $= \dfrac{c(a+b) - f^2 - g^2}{ab - h^2}$

$$= \frac{3(1-1) - 2^2 - \left(-\frac{3}{2}\right)^2}{1\cdot(-1) - (-3)^2} =$$

$$= \frac{-4 - \frac{9}{4}}{-1 - 9} = \frac{-25}{4 \times -10} = \frac{5}{8}$$

$\therefore \dfrac{3}{2\sqrt{k}} = \dfrac{5}{8} \Rightarrow \sqrt{k} = \dfrac{12}{5}$

$\Rightarrow k = \dfrac{144}{25}$

Ans: —

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21 a) $3x^2-2xy+3y^2=0$ $\quad$ P.I $\to (0,0)$

b) $x^2-y^2-2x+2y=0$ $\quad$ P.I $\to (1,1)$

c) $x^2-y^2+2y-1=0$ $\quad$ P.I $\to (0,1)$

d) $x^2-y^2-2x+1=0$ $\quad$ P.I $\to (1,0)$

Ans: t, p, r, q

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22 a) $x^2-2xy+3y^2-2x+y+1=0$

perpendicular distance from (0,0)

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

b) $\perp$r distance $=\frac{3}{2\sqrt{2}}$

c) $\perp$r distance $=3$

d) $\perp$r distance $=\frac{|1^2+2^2-2.1+3.2-1|}{\sqrt{(1-1)^2+4(0)^2}}$

$$=\frac{|\text{finite value}|}{0} = \text{Not defined}$$

Ans: s, p, q, r