

PAIR OF STRAIGHT LINES

PREVIOUS EAMCET BITS

1. The value of λ with $|\lambda| < 16$ such that $2x^2 - 10xy + 12y^2 + 5x + \lambda y - 3 = 0$ represents a pair of straight lines, is **[EAMCET 2009]**

1) -10 2) -9 3) 10 4) 9

Ans: 2

Sol. $\Delta = 0 \Rightarrow \lambda = -9$

2. The area (in square units) of the triangle formed by $x + y + 1 = 0$ and the pair of straight lines $x^2 - 3xy + 2y^2 = 0$ is **[EAMCET 2009]**

1) 7/12 2) 5/12 3) 1/12 4) 1/6

Ans: 3

Sol. Area = $\frac{n^2 \sqrt{h^2 - ab}}{|am^2 - 2h\ell m + b\ell^2|} = \frac{1}{12}$

3. The pairs of straight lines $x^2 - 3xy + 2y^2 = 0$ and $x^2 - 3xy + 2y^2 + x - 2 = 0$ form a **[EAMCET 2009]**

1) square but not rhombus 2) rhombus
3) parallelogram 4) rectangle but not a square

Ans: 3

Sol. In given two equations homogenous parts are same, hence is a parallelogram.

4. The value of λ such that $\lambda x^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0$ represents a pair of straight lines, is **[EAMCET 2008]**

1) 1 2) -1 3) 2 4) -2

Ans: 3

Sol. $\lambda x^2 - 10xy + 12y^2 + 5x - 16y - 3 = 0 \equiv ax^2 + 2hxy + by^2 + 2gx + 2fy + c = 0$

$$\Rightarrow a = \lambda, b = 12, c = -3, f = -8, g = 5/2, h = -5$$

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

$$\Rightarrow \lambda(12)(-3) + 2(-8)(5/2)(-5) - \lambda(-8)^2 - 12(5/2)^2 - (-3)(-5)^2 = 0$$

$$\Rightarrow -36\lambda + 200 - 64\lambda - 75 + 75 = 0 \Rightarrow 100\lambda = 200 \Rightarrow \lambda = 2$$

5. A pair of perpendicular straight lines passes through the origin and also through the point of intersection of the curve $x^2 + y^2 = 4$ with $x + y = a$. The set containing the value of 'a' is **[EAMCET 2008]**

1) $\{-2, 2\}$ 2) $\{-3, 3\}$ 3) $\{-4, 4\}$ 4) $\{-5, 5\}$

Ans: 1

Sol. Clearly the point of intersection of $x^2 + y^2 = 4, x + y = a$ is the origin

$$x^2 + y^2 = 4, x + y = a \Rightarrow x^2 + (a - x)^2 = 4, (x = 0) \Rightarrow a^2 = 4 \Rightarrow a = \pm 2$$

6. The angle between the pair of straight lines formed by joining the points of intersection of $x^2 + y^2 = 4$ and $y = 3x + c$ to the origin is a right angle. Then $c^2 =$ **[EAMCET 2007]**
 1) 20 2) 13 3) 1/5 4) 5

Ans: 1

Sol. $2c^2 = a^2(1 + m^2)$

$$\Rightarrow 2c^2 = 40 \Rightarrow c^2 = 20$$

7. If the lines $x^2 + 2xy - 35y^2 - 4x + 44y - 12 = 0$ and $5x + \lambda y - 8 = 0$ are cocurrent, then the value of λ is **[EAMCET 2007]**
 1) 0 2) 1 3) -1 4) 2

Ans: 4

Sol. Point of intersection of given pair of lines is $\left(\frac{4}{3}, \frac{2}{3}\right)$

$$\text{It lies on } 5x + \lambda y - 8 = 0 \Rightarrow \lambda = 2$$

8. The lines represented by the equation $x^2 - y^2 - x + 3y - 2 = 0$ are **[EAMCET 2006]**
 1) $x + y - 1 = 0, x - y + 2 = 0$ 2) $x - y - 2 = 0, x + y + 1 = 0$
 3) $x + y + 2 = 0, x - y - 1 = 0$ 4) $x - y + 1 = 0, x + y - 2 = 0$

Ans: 4

Sol. By verification

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

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

9. The centroid of the triangle formed by the pair of straight lines $12x^2 - 20xy + 7y^2 = 0$ and the line $2x - 3y + 4 = 0$ is **[EAMCET 2006]**

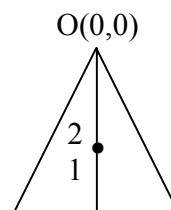
- 1) $\left(-\frac{7}{3}, \frac{7}{3}\right)$ 2) $\left(-\frac{8}{3}, \frac{8}{3}\right)$ 3) $\left(\frac{8}{3}, \frac{8}{3}\right)$ 4) $\left(\frac{4}{3}, \frac{4}{3}\right)$

Ans: 3

Sol. Centroid divides median in the ratio of 2 : 1

\therefore of (x_1, y_1) is centroid then $\left(\frac{3x_1}{2}, \frac{3y_1}{2}\right)$ must lie on

$2x - 3y + 4 = 0$ by verification $\left(\frac{8}{3}, \frac{8}{3}\right)$ is centroid



10. The area of the triangle formed by the pair of straight lines $(ax + by)^2 - 3(bx - ay)^2 = 0$ and $ax + by + c = 10$ is **[EAMCET 2005]**

- 1) $\frac{c^2}{a^2 + b^2}$ 2) $\frac{c^2}{2(a^2 + b^2)}$ 3) $\frac{c^2}{\sqrt{2}(a^2 + b^2)}$ 4) $\frac{c^2}{\sqrt{3}(a^2 + b^2)}$

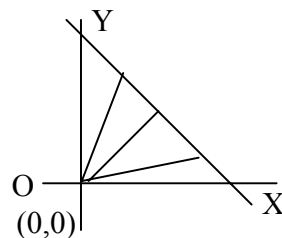
Ans: 4

Sol.

\perp distance from $O(0, 0)$ to $ax + by + c = 0$ is

$$h = \frac{c}{\sqrt{a^2 + b^2}}$$

$$\text{Area} \frac{h^2}{\sqrt{3}} = \frac{c}{\sqrt{3}(a^2 + b^2)}$$



11. The product of the perpendicular distances from the origin on the pair of straight lines

$$12x^2 + 25xy + 12y^2 + 10x + 11y + 2 = 0 \text{ is}$$

[EAMCET 2005]

- 1) $\frac{1}{25}$ 2) $\frac{2}{25}$ 3) $\frac{3}{25}$ 4) $\frac{4}{25}$

Ans: 2

Sol. Product of perpendiculars = $\frac{|c|}{\sqrt{(a-b)^2 + (2h)^2}} = \frac{2}{25}$

12. The angle between the lines represented by $y^2 \sin^2 \theta - xy \sin^2 \theta + x^2 (\cos^2 \theta - 1) = 0$ is

[EAMCET 2004]

- 1) $\frac{\pi}{3}$ 2) $\frac{\pi}{4}$ 3) $\frac{\pi}{6}$ 4) $\frac{\pi}{2}$

Ans: 4

Sol. $a + b = 0 \Rightarrow \theta = 90^\circ$

13. Area of the triangle formed by the lines $3x^2 - 4xy + y^2 = 0, 2x - y = 6$ is

[EAMCET 2004]

- 1) 16 2) 25 3) 36 4) 49

Ans: 3

Sol. Area of the triangle = $\left| \frac{n^2 \sqrt{h^2 - ab}}{am^2 - 2h\ell m + b\ell^2} \right| = 36 \text{ sq. units}$

14. If the pair of straight lines given by $Ax^2 + 2Hxy + By^2 = 0 (H^2 > AB)$ forms an equilateral triangle with line $ax + by + c = 0$, then $(A + 3B)(3A + B) = \dots$

[EAMCET 2003]

- 1) H^2 2) $-H^2$ 3) $2H^2$ 4) $4H^2$

Ans: 4

Sol. Equation of one side $ax + by + c = 0$ and other two sides passing through origin then the equation of other two sides is $(ax + by)^2 - 3(bx - ay)^2 = 0$

$$A = a^2 - 3b^2; B = b^2 - 3a^2; H = 8ab$$

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

15. The area (in square units) of the quadrilateral formed by the two pairs of lines

$$\ell^2 x^2 - m^2 y^2 - n(\ell x + my) = 0 \text{ and } \ell^2 x^2 - m^2 y^2 + n(\ell x - my) = 0 \quad \text{[EAMCET 2003]}$$

$$1) \frac{n^2}{2|\ell.m|} \quad 2) \frac{n^2}{|\ell.m|} \quad 3) \frac{n^2}{|\ell.m|} \quad 4) \frac{n^2}{4|\ell.m|}$$

Ans: 1

Sol. $\ell^2 x^2 - m^2 y^2 - n(\ell x + my) = 0$

$$\Rightarrow (\ell x + my)(\ell x - my - n) = 0$$

$$\ell^2 x^2 - m^2 y^2 + n(\ell x - my) = 0$$

$$\Rightarrow (\ell x - my)(\ell x + my + n) = 0$$

The given lines form a rhombus

$$\therefore \text{Area of rhombus} = \frac{c^2}{2|ab|} = \frac{n^2}{2|\ell m|}$$

16. If the coordinate axes are the bisectors of the angle between the pair of lines $ax^2 + 2hxy + by^2 = 0$, where $h^2 > ab$ and $a \neq b$, then [EAMCET 2002]

$$1) a + b = 0 \quad 2) h = 0 \quad 3) h \neq 0, a + b = 0 \quad 4) a + b \neq 0$$

Ans: 2

Sol. Equation of pair of angular bisectors is $h(x^2 - y^2) - (a - b)xy = 0$

Equation of coordinate axes is $xy = 0$

$$\therefore h = 0$$

17. If the angle 2θ is acute then the acute angle between the pair of straight lines $x^2(\cos\theta - \sin\theta) + 2xy \cos\theta + y^2(\cos\theta + \sin\theta) = 0$ [EAMCET 2002]

$$1) 2\theta \quad 2) \theta/2 \quad 3) \theta/3 \quad 4) \theta$$

Ans: 4

$$\text{Sol. } \cos \alpha = \frac{|a + b|}{\sqrt{(a - b)^2 + 4h^2}}$$

(α is angle between the pair of lines and $a = \cos\theta + \sin\theta$, $b = \cos\theta - \sin\theta$, $2h = 2 \cos\theta$)

$$\cos \alpha = \cos \theta$$

\therefore Angle ' θ '

18. If the pair of straight lines $xy - x - y + 1 = 0$ and the line $ax + 2y - 3 = 0$ are concurrent, then $a =$ **[EAMCET 2002]**

- 1) -2 2) 3 3) 1 4) 0

Ans: 3

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

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

$ax + 2y - 3 = 0$ line passes through (1, 1)

$$\therefore a = 1$$

19. The orthocentre of the triangle formed by the lines $x + 3y = 10$ and $6x^2 + xy - y^2 = 0$ is

[EAMCET 2001]

- 1) (1, 3) 2) (3, 1) 3) (-1, 3) 4) (1, -3)

Ans: 1

Sol. The given lines are $x + 3y = 10$, $6x^2 + xy - y^2 = 0$

$$\ell = 1, m = 3, n = 10, a = 6, h = \frac{1}{2}; b = -1$$

$$\therefore \text{Orthocentre} = ((k\ell; km) \text{ where } k = \frac{n(a+b)}{am^2 - 2h\ell m + b\ell^2}$$

20. If one of the lines of the pair of straight lines $ax^2 + 2hxy + by^2 = 0$ bisects the angle between the co-ordinate axes then : **[EAMCET 2001]**

- 1) $a^2 + b^2 = h^2$ 2) $(a+b)^2 = h^2$ 3) $a^2 + b^2 = 4h^2$ 4) $(a+b)^2 = 4h^2$

Ans: 4

Sol. The angle bisectors of the axes are $x \pm y = 0$

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

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

21. If the slope of one line is twice the slope of the other in the pair of straight lines $ax^2 + 2hxy + by^2 = 0$, then $8h^2 =$ **[EAMCET 2001]**

- 1) -9ab 2) 9ab 3) 7ab 4) -7ab

Ans: 2

Sol. If slope of one line is 'k' times to other then

$$4kh^2 = (k+1)^2 ab \Rightarrow 8h^2 = 9ab$$

22. The equation of the pair of lines through the point (a, b) parallel to the coordinate axes is

[EAMCET 2000]

- 1) $(x-b)(y-a) = 0$ 2) $(x-b)(y+b) = 0$
3) $(x-a)(y-b) = 0$ 4) $(x+a)(y-b) = 0$

Ans: 3

Sol. The equation of the coordinate axes is $xy = 0$

∴ The equation of the pair of lines passing through (a, b) and parallel to $xy = 0$ is $(x - a)(y - b) = 0$



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