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. Reduce the following equations into intercept form and find their intercepts on the axes.

(i) 3x + 2y – 12 = 0

(ii) 4x – 3y = 6

(iii) 3y + 2 = 0

Solution:

(i) 3x + 2y – 12 = 0

Given:

The equation is 3x + 2y – 12 = 0

Equation of line in intercept form is given by x/a + y/b = 1, where ‘a’ and ‘b’ are intercepts on x axis and y – axis respectively.

So, 3x + 2y = 12

now let us divide both sides by 12, we get

3x/12 + 2y/12 = 12/12

x/4 + y/6 = 1

∴ The above equation is of the form x/a + y/b = 1, where a = 4, b = 6

Intercept on x – axis is 4

Intercept on y – axis is 6

(ii) 4x – 3y = 6

Given:

The equation is 4x – 3y = 6

Equation of line in intercept form is given by x/a + y/b = 1, where ‘a’ and ‘b’ are intercepts on x axis and y – axis respectively.

So, 4x – 3y = 6

Now let us divide both sides by 6, we get

4x/6 – 3y/6 = 6/6

2x/3 – y/2 = 1

x/(3/2) + y/(-2) = 1

∴ The above equation is of the form x/a + y/b = 1, where a = 3/2, b = -2

Intercept on x – axis is 3/2

Intercept on y – axis is -2

(iii) 3y + 2 = 0

Given:

The equation is 3y + 2 = 0

Equation of line in intercept form is given by x/a + y/b = 1, where ‘a’ and ‘b’ are intercepts on x axis and y – axis respectively.

So, 3y = -2

Now, let us divide both sides by -2, we get

3y/-2 = -2/-2

3y/-2 = 1

y/(-2/3) = 1

∴ The above equation is of the form x/a + y/b = 1, where a = 0, b = -2/3

Intercept on x – axis is 0

Intercept on y – axis is -2/3

3. Reduce the following equations into normal form. Find their perpendicular distances from the origin and angle between perpendicular and the positive x-axis.

(i) x – √3y + 8 = 0

(ii) y – 2 = 0

(iii) x – y = 4

Solution:

(i) x – √3y + 8 = 0

Given:

The equation is x – √3y + 8 = 0

Equation of line in normal form is given by x cos θ + y sin θ = p where ‘θ’ is the angle between perpendicular and positive x axis and ‘p’ is perpendicular distance from origin.

So now, $x – \sqrt{3}y + 8 = 0$

$x – \sqrt{3}y = -8$

Divide both the sides by $\sqrt{(1^2 + (\sqrt{3})^2)} = \sqrt{(1 + 3)} = \sqrt{4} = 2$

$x/2 – \sqrt{3}y/2 = -8/2$

$(-1/2)x + \sqrt{3}/2y = 4$

This is in the form of: $x \cos 120^o + y \sin 120^o = 4$

∴ The above equation is of the form x cos θ + y sin θ = p, where θ = 120° and p = 4.

Perpendicular distance of line from origin = 4

Angle between perpendicular and positive x – axis = 120°

(ii) $y – 2 = 0$

Given:

The equation is $y – 2 = 0$

Equation of line in normal form is given by x cos θ + y sin θ = p where ‘θ’ is the angle between perpendicular and positive x axis and ‘p’ is perpendicular distance from origin.

So now, $0 \times x + 1 \times y = 2$

Divide both sides by $\sqrt{(0^2 + 1^2)} = \sqrt{1} = 1$

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

This is in the form of: $x \cos 90^o + y \sin 90^o = 2$

∴ The above equation is of the form x cos θ + y sin θ = p, where θ = 90° and p = 2.

Perpendicular distance of line from origin = 2

Angle between perpendicular and positive x – axis = 90°

(iii) $x – y = 4$

Given:

The equation is $x – y + 4 = 0$

Equation of line in normal form is given by $x \cos \theta + y \sin \theta = p$ where ‘θ’ is the angle between perpendicular and positive x axis and ‘p’ is perpendicular distance from origin.

So now, $x – y = 4$

Divide both the sides by $\sqrt{(1^2 + 1^2)} = \sqrt{(1+1)} = \sqrt{2}$

$x/\sqrt{2} – y/\sqrt{2} = 4/\sqrt{2}$

$(1/\sqrt{2})x + (-1/\sqrt{2})y = 2\sqrt{2}$

This is in the form: $x \cos 315^o + y \sin 315^o = 2\sqrt{2}$

∴ The above equation is of the form $x \cos \theta + y \sin \theta = p$, where $\theta = 315°$ and $p = 2\sqrt{2}$.

Perpendicular distance of line from origin = $2\sqrt{2}$

Angle between perpendicular and positive x – axis = 315°

4. Find the distance of the point (–1, 1) from the line 12(x + 6) = 5(y – 2).