33°
52′
37″S
151°
06′
04″E

JE
MATHS

10
ADV

- distance formula: $d=\sqrt{(x_1-x_2)^2+(y_1-y_2)^2}$

1. Find the exact distance of $P(2\sqrt{2},2)$ from the origin O.

2. Given that a circle with the centre O(-5, $-\sqrt{3}$). If one point P(-1, $\sqrt{3}$) is on this circle, find the equation of this circle.

- midpoint formula: $(\frac{x_1+x_2}{2},\frac{y_1+y_2}{2})$

3. Given that $O(-1,2)$ is the centre of a circle with a diameter AB going through it.
   If A(-3, 6), find the coordinate of B.

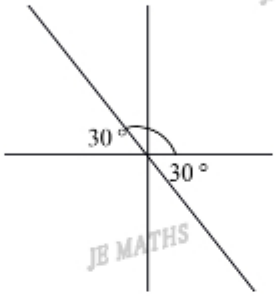
4. Given that P(4, -7) is one vertex of a rhombus PQRS, and the centre of the rhombus is O(8, -2), find the coordinates of the opposite vertex R.

- gradient formula: $m = \dfrac{rise}{run} = \dfrac{y_1 - y_2}{x_1 - x_2}$

5. Find the gradient of $P(2\sqrt{2}, 2)$ from its inverse point Q.

- the angle of inclination: $\tan\alpha = m$

6. Find the exact angle of inclination α if the gradient is $-\dfrac{\sqrt{3}}{3}$



− two lines are parallel: $l_1 \parallel l_2 \Leftrightarrow m_1 = m_2$

− two lines are perpendicular: $l_1 \perp l_2 \Leftrightarrow m_1 \cdot m_2 = -1$

7. The interval PQ has gradient -3. A second line passes through A(-2, 4) and B(1, k). Find k.
(a) if AB is parallel to PQ.

(b) if AB is perpendicular to PQ.

8. For A(k, 1), B(-2, -3), C(2, 3) and D(1, k), find k:
   (a) if AB is parallel to CD.

   (b) if AB is perpendicular to CD.

- equation of lines:

- general form: $ax + by + c = 0$

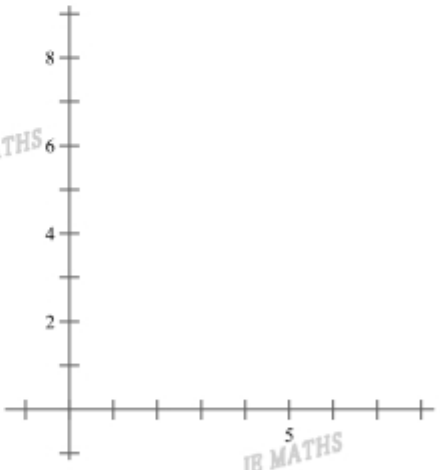
- point-gradient form: $y - y_1 = m(x - x_1)$

- two points form: $y - y_1 = \frac{y_1 - y_2}{x_1 - x_2}(x - x_1)$

- analytical geometry:

9. The three points A(1, 0), B(0, 8) and C(7, 4) form a triangle.
   Let θ be the angle between AC and the x-axis.
   (a) Plot all points to the given number plane and indicate the angle θ.

   (b) Find the value of θ, to the nearest degree.



   (c) Find the general equation of AC.

   (d) If D is the mid-point of AC, find the coordinate of point D.

(e) Show that:

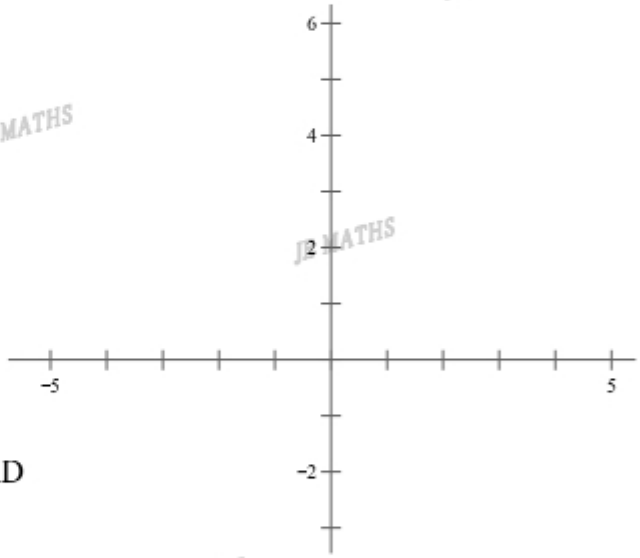
(i) AB = BC (ii) AC ⊥ BD.

(f) Name ΔABC.

(g) Find the area of ΔABC.

10. The points A(-5, -1), B(-1, 5) and D(0, -3) are 3 vertices of a quadrilateral.

(a) Write down the coordinates of the 4th vertex C, such that ABCD is a parallelogram.



(b) Find the general equation of BD.

(c) Find the distance of

(i) BD. (ii) AB (iii) AD

(d) Find ∠A by using the cosine rule, to the nearest minutes.

(e) Find the area of ABCD by using the area of the triangle by sine. (0dp)

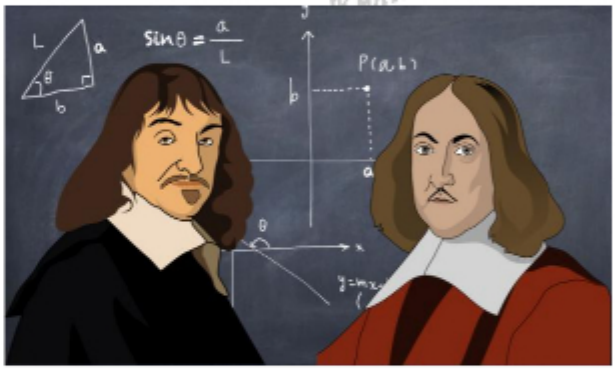
11. Prove that the midpoint of hypotenuse of a right angle triangle is equidistance from its vertices.

12. Consider a circle with centre C(4, 6) and radius 2. A line x + y = 8 cuts this circle at A and B, while A is to the left of B. Another line passing through C perpendicular to AB cuts AB at X and cutting the major arc AB at E.

(a) Sketch the diagram from the above with the given information marked clearly.

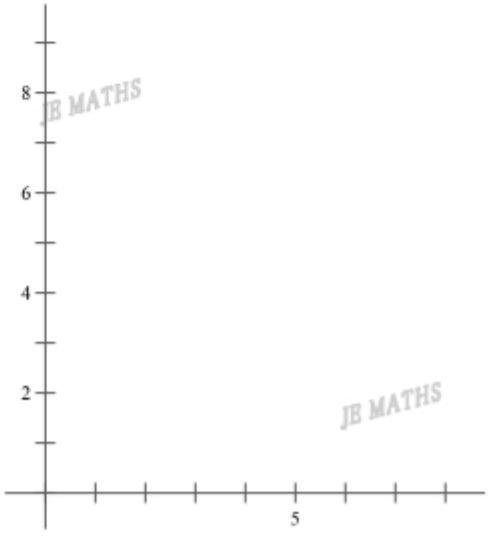
(b) Find the equation of the circle.

(c) Show that the coordinate of points A (2, 6) and point B (4, 4) by solving simultaneous equations.



Descartes and Fermat
founded analytic geometry in the 1630s

(d) Find the general equation of line XC.



(e) If line CX meets the y-axis at D and line AB meets the x-axis at F.

(i) Find the coordinates of D and F.

(ii) Hence, find the area of the quadrilateral DEFO.

(f) Show that ΔAXC is an isosceles right angle triangle.

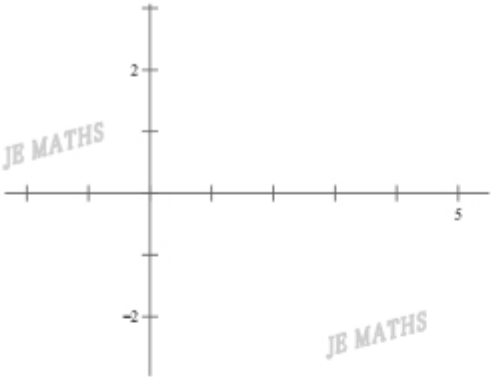
(g) Prove that $\angle ACX = 45^\circ$.

(h) Show that $\angle AEC = 22°30'$.

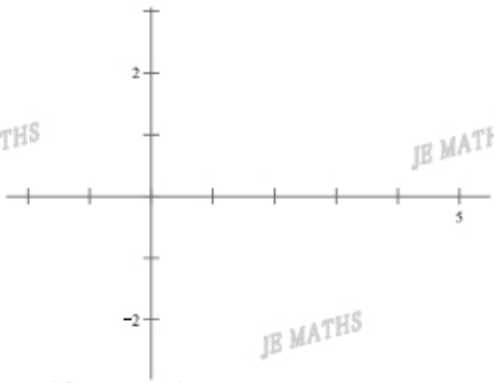
(i) Prove that $\cos 22°30' = \dfrac{2+\sqrt{2}}{2\sqrt{1+\sqrt{2}}}$ by using trigonometry.

13. (a) Sketch the following region:

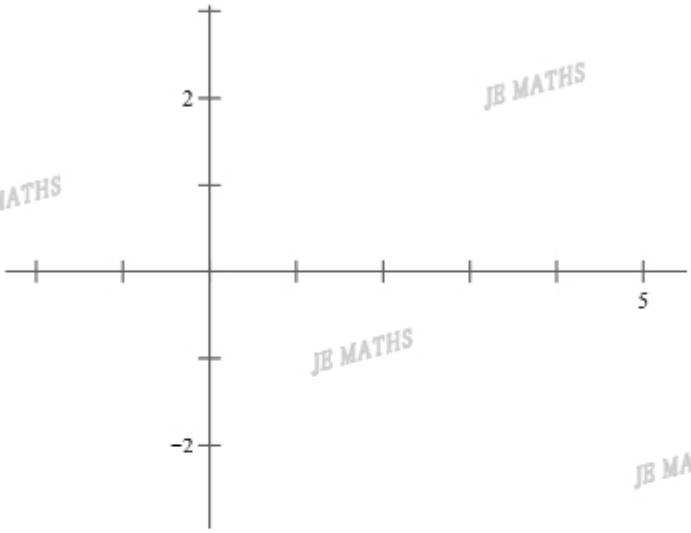
(i) $y \le 2x$



(ii) $2x + y < 1$

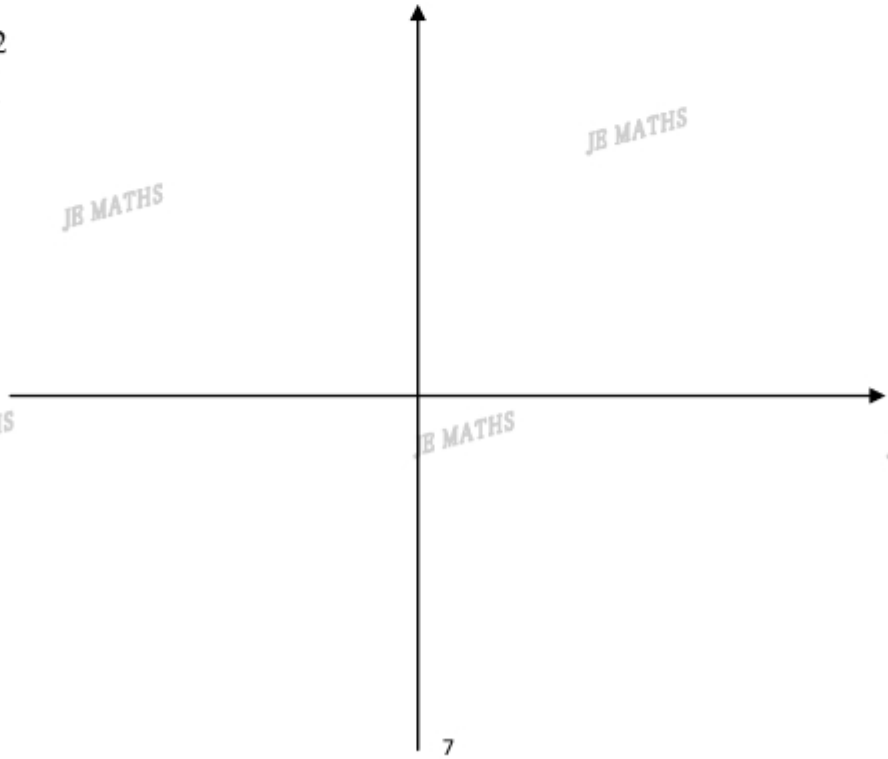


(b) Hence, sketch the common region to $y \le 2x$ and $2x - y > 1$.

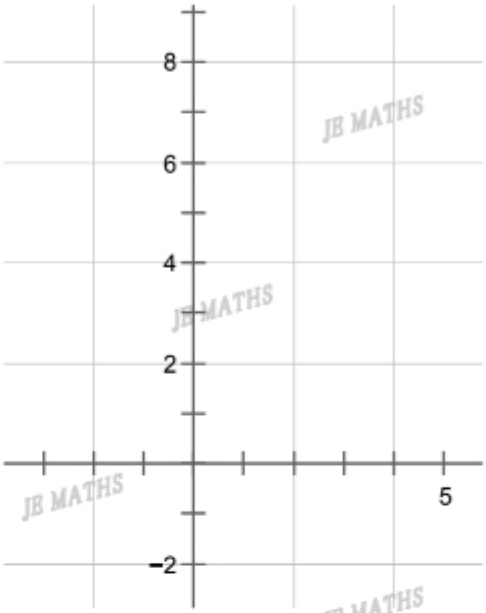


14. Solve graphically the following system of linear inequalities.

$$\begin{cases} x \ge 0 \\ y \ge 0 \\ x - y \ge -2 \\ x - 2y < 1 \end{cases}$$



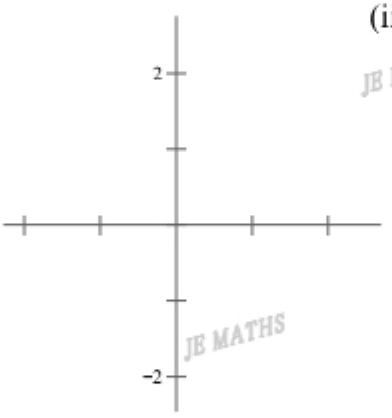
15. (a) Sketch the region bounded by $\begin{cases} 2x+y \le 6 \\ y \ge x \\ x \ge -1 \end{cases}$ and show all of the vertices of the region.



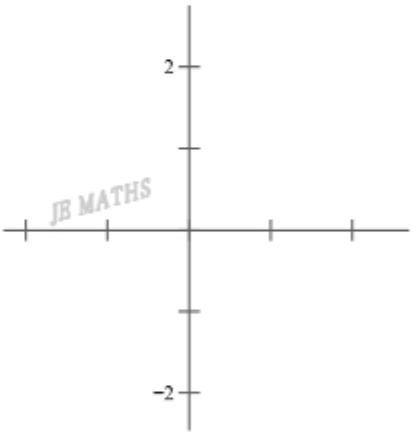
(b) Find the area of the common region.

16. (a) Sketch the following region:

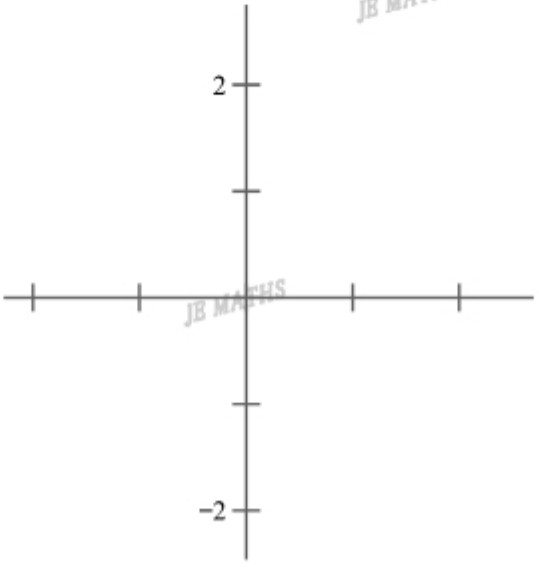
(i) $y \le x^3$



(ii) $x < 1$



(b) Hence, sketch the common region of $y \le x^3$ and $x < 1$.

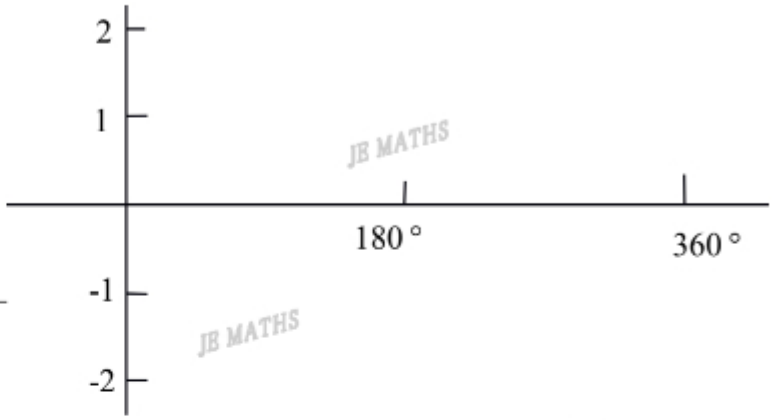


17. Sketch the common region of the following two curve lines and indicate their intersection points.

(a) $y \geq x^2$ and $y \leq x^3$

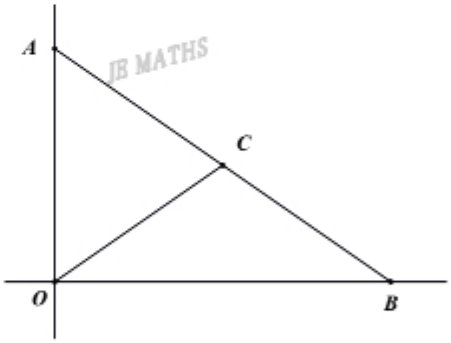
(b) $y \leq \sin x$ and $y \geq \cos x$,

$0° \leq x \leq 360°$



18. Use coordinate geometry to prove that the midpoint of the hypotenuse of a right angle is equidistant from the three vertices.

Question: Given that ΔOAB is a right angle triangle, with A(0, a) and B(b, 0), if C is the midpoint of AB, show that AC=CO=BC.



19. Given that a circle of center C(r, r) with radius r inscribe in a Rt Δ ABO with Rt∠ at the origin.

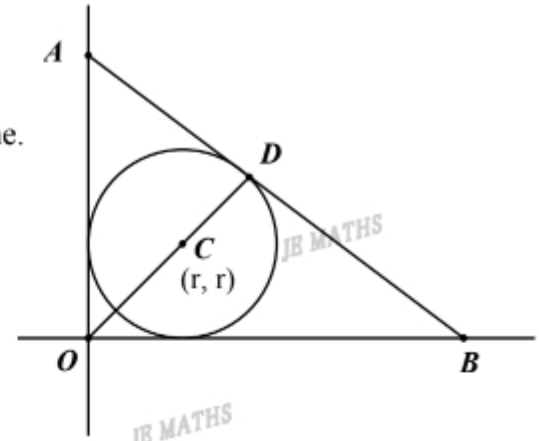
(a) Find the equations of:

(i) l_{OC}.

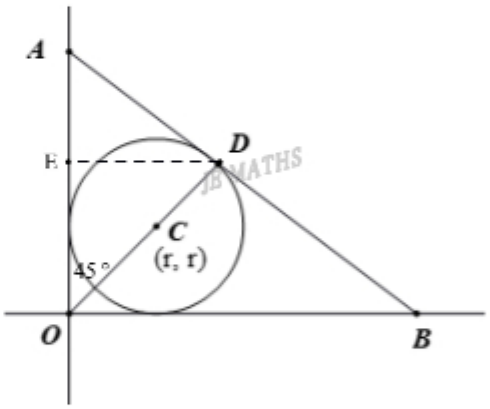
(ii) circle C.

(b) Show that the contact point $D(r(\frac{1}{\sqrt{2}}+1), r(\frac{1}{\sqrt{2}}+1))$

by solving simultaneous equations of a circle and a line.



(c) Show that ΔADO is an isosceles right angle triangle.



(d) Hence, show that $A(r(\sqrt{2}+2), 0)$.

1
2
3
Avg:

Week___