

**www.m4ths.com – Linear and Non-Linear Simultaneous Equations – Steve Blades ©**

(1) Solve the following linear simultaneous equations for  $x$  and  $y$  :

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

(b)  $5x - 3y = 3$   
 $2x + 2y = 14$

(c)  $x - \frac{1}{2}y = 0$   
 $\frac{1}{3}x + 2y = \frac{-13}{4}$

(2) Solve the following simultaneous equations:

(a)  $y = x + 1$   
 $y = x^2 + x$

(b)  $y = 1 - x$   
 $y = x^2 - 11$

(c)  $y = 3x^2 + 9x - 1$   
 $y = x^2 + 4x + 2$

(3) Sketch the graphs of  $y = 4 - x$  and  $y = x^2 + 5x$  on the same set of axes showing any points of intersection with the coordinate axes.

(b) Find the coordinates of the points where the graphs meet.

(4) Solve the following simultaneous equations:

(a)  $x + y = 3$   
 $x^2 - y^2 = 21$

(b)  $x + y = 3$   
 $x^2 + y^2 = 5$

(c)  $x^2 + 2y^2 = 6$   
 $y - 3x = 5$

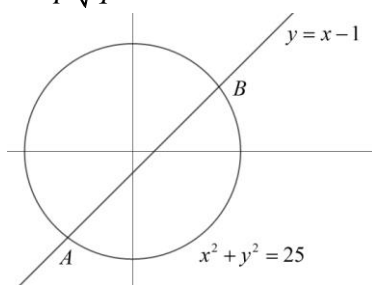
(5) Solve the following simultaneous equations:

(a)  $x - 2y = -8$   
 $xy + y^2 = 3$

(b)  $xy + x^2 = \frac{5}{18}$   
 $x + y - \frac{5}{6} = 0$

(c)  $x = \frac{12}{y}$   
 $2x - y - 5 = 0$

(6) The diagram below shows the line with equation  $y = x - 1$  and the circle with equation  $x^2 + y^2 = 25$ . The line intersects the circle at the points  $A$  and  $B$ . Find the length of the chord  $AB$  in the form  $p\sqrt{q}$ .

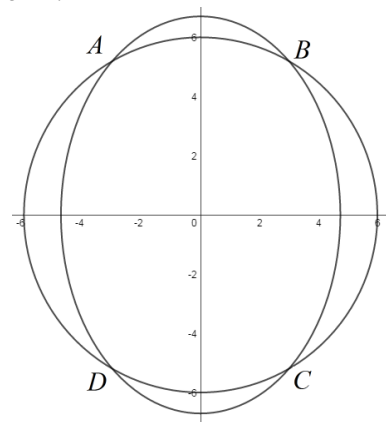


(7) (a) Sketch the graphs of  $3x = 4y$  and  $y = \frac{48}{x}$  on the same set of axes showing any points of intersection with the coordinate axes.

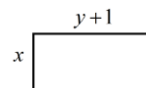
(b) Find the coordinates of the points where the graphs meet.

(c) Write down the  $x$  coordinate that lies on the line  $3x = 4y$  but not on the curve  $y = \frac{48}{x}$ .

(8) The graphs of  $x^2 + y^2 = 36$  and  $2x^2 + y^2 = 45$  are shown below. The graphs intersect at the points  $A, B, C$  and  $D$ . Find the area of the rectangle  $ABCD$  giving your answer in exact form.

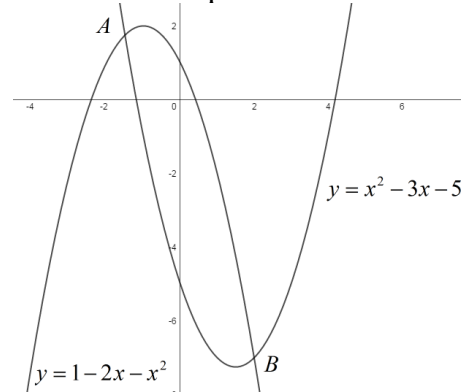


(9) The dimension of rectangular room are  $y + 1$  and  $x$ ,  $y > x$  as shown in the diagram below.



Given that the area of the room is  $28m^2$  and the perimeter of the room is  $22m$ , find the length of the diagonals of the room giving your answer in exact form.

(10) The diagram below shows the graphs of  $y = x^2 - 3x - 5$  and  $y = 1 - 2x - x^2$ . The graphs intersect at the points  $A$  and  $B$ .



Show that the straight line passing through the points  $A$  and  $B$  has gradient  $-\frac{35}{14}$ .