

# Simultaneous Equations

## Exercise 4S Skills Practice

- 1 Find the coordinates of the point of intersection for each pair of lines.
- a  $y = 2x - 3$       b  $y = \frac{1}{2}x$       c  $y = 2 - x$   
 $y = x + 4$        $y = 3x - 2$        $y = 4x + 1$
- 2 Find the pair of values  $(x, y)$  which satisfy each pair of equations.
- a  $2x + y = 9$       b  $4x + y = 10$       c  $x - 4y = -6$   
 $x - y = 3$        $3x + y = 7$        $2x + y = 33$
- d  $2x - 3y = 29$       e  $4x - 5y = 3$       f  $4x + y = 8$   
 $5x + 2y = 25$        $3x - 8y = 15$        $6x - 3y = -15$
- g  $2x + y - 14 = 0$       h  $3x + 2y - 10 = 0$       i  $3x - 2y - 9 = 0$   
 $x - 3y - 21 = 0$        $9x - 5y + 14 = 0$        $8x + 4y - 31 = 0$
- 3 Find the coordinates of the points of intersection for the given curve and line.
- a  $y = x^2 + 4$       b  $y = 2x - x^2$       c  $y = 5 - 2x - 4x^2$   
 $y = 4x + 1$        $y = x - 2$        $y = 9 - 12x$
- 4 Solve each pair of simultaneous equations.
- a  $x^2 + y - 10 = 0$       b  $y^2 + 3y - x = 4$       c  $x^2 + y^2 = 25$   
 $x - y - 2 = 0$        $2y + x = 2$        $x - 2y = -5$
- d  $x^2 - y + 3 = 0$       e  $x^2 + 2xy = 15$       f  $5x^2 - y^2 = 20$   
 $3x + 2y - 8 = 0$        $x + y = 4$        $5x - y = 10$
- g  $y^2 - 2xy + 5 = 0$       h  $x^2 + 4x + y^2 = 21$       i  $2x^2 - 5xy + 18 = 0$   
 $y - x + 2 = 0$        $x + 3y = 13$        $2x + 5y - 18 = 0$
- 5 Find in each case if the line and curve intersect. If they do so, find the coordinates of any points of intersection.
- a  $x + 2y = 10$       b  $y = 2x - 5$       c  $y = x + 1$   
 $x^2 + y^2 = 100$        $y = x^2 - 2$        $x^2 - 5y + 2y^2 = 7$
- d  $x + 4y = 8$       e  $4x + 3y = 1$       f  $x - 3y = 4$   
 $x^2 - xy + 2y = 14$        $2x^2 + y - y^2 = 2$        $2x^2 + x + y^2 = 4$
- 6 Solve each pair of simultaneous equations.
- a  $y = \frac{2}{x} - 3$       b  $2x + \frac{1}{y} = 11$       c  $2x^2 + y^2 = 33$   
 $y = x - 2$        $x - \frac{1}{y} = 1$        $x^2 - y^2 = 15$

### Exercise 4S Skills Practice

- 1 a (7, 11)      b  $(\frac{4}{5}, \frac{2}{5})$       c  $(\frac{1}{5}, \frac{9}{5})$
- 2 a (4, 1)      b (3, -2)      c (14, 5)  
d (7, -5)      e (-3, -3)      f  $(\frac{1}{2}, 6)$   
g (9, -4)      h  $(\frac{2}{3}, 4)$       i  $(\frac{1}{2}, \frac{3}{4})$
- 3 a (1, 5), (3, 13)      b (-1, -3), (2, 0)  
c  $(\frac{1}{2}, 3)$ , (2, -15)
- 4 a  $x = -4, y = -6; x = 3, y = 1$   
b  $x = 14, y = -6; x = 0, y = 1$   
c  $x = -5, y = 0; x = 3, y = 4$   
d  $x = \frac{1}{2}, y = \frac{13}{4}; x = -2, y = 7$   
e  $x = 3, y = 1; x = 5, y = -1$   
f  $x = 2, y = 0; x = 3, y = 5$   
g  $x = 3, y = 1; x = -3, y = -5$   
h  $x = 1, y = 4; x = -2, y = 5$   
i  $x = 3, y = \frac{12}{5}; x = \frac{3}{2}, y = 3$
- 5 a (-6, 8), (10, 0)      b do not intersect  
c  $(-\frac{5}{3}, -\frac{2}{3}), (2, 3)$       d (4, 1),  $(-\frac{2}{3}, \frac{5}{2})$   
e (-2, 3), (4, -5)      f  $(-\frac{20}{19}, -\frac{32}{19}), (1, -1)$
- 6 a  $x = -2, y = -4; x = 1, y = -1$       b  $x = 4, y = \frac{1}{3}$   
c  $x = 4, y = \pm 1; x = -4, y = \pm 1$

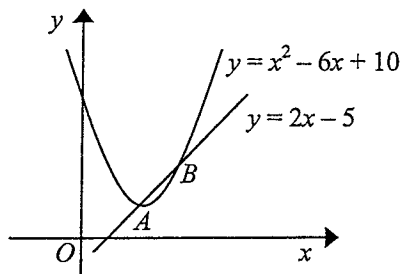
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| <b>Exercise 4E   Exam Practice</b> |
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- 1 Solve the simultaneous equations

$$\begin{aligned} 6x - 2xy + y^2 &= 15 \\ 8x - y &= 0 \end{aligned}$$

**(5 marks)**

- 2



The diagram shows the curve  $y = x^2 - 6x + 10$  and the line  $y = 2x - 5$  which intersect at the points  $A$  and  $B$ .

- a Find the coordinates of the points  $A$  and  $B$ . **(4 marks)**  
 b Find the exact length  $AB$  in its simplest form. **(3 marks)**

- 3 a Given that

$$9^{2p+1} = 27^{q-2}$$

find a linear relationship between  $p$  and  $q$ .

**(2 marks)**

- b Solve the simultaneous equations

$$9^{2p+1} = 27^{q-2}$$

$$\left(\frac{1}{2}\right)^{q-3} = 16^{p+1}$$

**(5 marks)**

- 4 The points  $(2 - a, b - 1)$  and  $(3 - 2b, 5a - 9)$  lie on the line  $2y - 5x + 6 = 0$ .

Find the values of the constants  $a$  and  $b$ .

**(5 marks)**

- 5 a Show that the line  $y = 2x + 10$  is a tangent to the curve  $y = 1 - 4x - x^2$ . **(4 marks)**

- b The line  $x - y + k = 0$  is also a tangent to the curve  $y = 1 - 4x - x^2$ . Find the value of  $k$ . **(4 marks)**

- 6 By first letting  $X = \frac{1}{x}$  and  $Y = \frac{1}{y}$ , or otherwise, solve the simultaneous equations

$$\frac{3}{x} + \frac{2}{y} = 9$$

$$\frac{12}{x} - \frac{1}{y} = 0$$

**(5 marks)**

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| <b>Exercise 4E   Exam Practice</b> |
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- 1  $x = \frac{1}{2}, y = 4; x = -\frac{5}{8}, y = -5$   
 2 a  $(3, 1), (5, 5)$  b  $2\sqrt{5}$   
 3 a  $4p = 3q - 8$  b  $p = -\frac{11}{16}, q = \frac{7}{4}$   
 4  $a = \frac{1}{5}, b = \frac{5}{2}$   
 5 b  $\frac{29}{4}$   
 6  $x = 3, y = \frac{1}{4}$