Algebra - Non-Linear Simultaneous Equations

Q1

Solve algebraically these simultaneous equations.

$$x^2 + y^2 = 17$$
$$y = x - 3$$

_____ **[6]**

Q2

Solve algebraically these simultaneous equations.

$$y = (x + 5)(x - 7)$$
$$y = 2x - 3$$

$x =$ _____ $y =$ _____

$x =$ _____ $y =$ _____ **[5]**

Algebra - Non-Linear Simultaneous Equations

Q1

Solve algebraically these simultaneous equations.

$$x^2 + y^2 = 17 \quad (1)$$
$$y = x - 3 \quad (2)$$

Substitute for y in (1)

$x^2 + (x-3)^2 = 17$

$x^2 + x^2 - 6x + 9 = 17$

$2x^2 - 6x + 9 - 17 = 0$

$2x^2 - 6x - 8 = 0$

$x^2 - 3x - 4 = 0$

$(x+1)(x-4) = 0$

$+1 \quad -4$ ✓
$-1 \quad +4$
$+2 \quad -2$

Either $x + 1 = 0$ or $x - 4 = 0$

$\Rightarrow x = -1$ $\quad$ $\Rightarrow x = 4$

Substitute for x in (2)

when $x = -1$

$y = -1 - 3$

$y = -4$

when $x = 4$

$y = 4 - 3$

$y = 1$

Solution

$\begin{cases} x = -1 \\ y = -4 \end{cases}$ $\quad$ $\begin{cases} x = 4 \\ y = 1 \end{cases}$

[6]

Algebra - Non-Linear Simultaneous Equations

Q2

Solve algebraically these simultaneous equations.

$$y = (x + 5)(x - 7) \quad (1)$$
$$y = 2x - 3 \quad (2)$$

Substitute for y in (1)

$$2x - 3 = (x+5)(x-7)$$
$$2x - 3 = x^2 + 5x - 7x - 35$$
$$0 = x^2 - 2x - 35 - 2x + 3$$
$$0 = x^2 - 4x - 32$$
$$0 = (x+4)(x-8)$$

+1	−32
−1	+32
+2	−16
−2	+16
+4	−8 ✓
−4	+8

Either $x + 4 = 0$ or $x - 8 = 0$

$\Rightarrow x = -4$ $\Rightarrow x = 8$

Substitute for x in (2)

when $x = -4$
$y = 2(-4) - 3$
$y = -11$

$\begin{cases} x = -4 \\ y = -11 \end{cases}$

when $x = 8$
$y = 2(8) - 3$
$y = 13$

$\begin{cases} x = 8 \\ y = 13 \end{cases}$

$x =$ −4 $y =$ −11

$x =$ 8 $y =$ 13 **[5]**