

Ex: 13.11

Solve the following equations simultaneously.

1. $y=4$ and $y=(x-3)^2+4$.

$$4 = (x-3)^2 + 4$$

$$(x-3)^2 + 4 = 4$$

$$(x-3)^2 + 4 - 4 = 0$$

$$(x-3)^2 = 0$$

$$x-3 = 0$$

$$x = 3$$

$$\underline{x=3, y=4}$$

2. $y = 2x^2 + 4x + 1$ and $y = 3x + 11$

$$2x^2 + 4x + 1 = 3x + 11$$

$$2x^2 + 4x + 1 - 3x - 11 = 0$$

$$2x^2 + x - 10 = 0 \quad -10 \times 2 = -20$$

$$2x^2 + 5x - 4x - 10 = 0$$

$$x(2x+5) - 2(2x+5) = 0$$

$$(2x+5)(x-2) = 0$$

$$2x+5=0, \quad x-2=0$$

$$2x = -5, \quad x = 2$$

$$x = -\frac{5}{2}$$

$$= -2.5$$

Sub $x = -2.5$ in $y = 3x + 11$

$$y = 3x - 2.5 + 11$$

$$\underline{y = 8.5}$$

$$\underline{x = -2.5, y = 8.5}$$

Sub $x = 2$ in $y = 3x + 11$

$$y = 3x + 11$$

$$\underline{y = 17}$$

$$\underline{x = 2, y = 17}$$

5. $y = -2x + 2$ and $y = 2(x-3)^2 - 16$

$$2(x-3)^2 - 16 = -2x + 2$$

$$2(x^2 - 6x + 9) - 16 = -2x + 2$$

$$2x^2 - 12x + 18 - 16 = -2x + 2$$

$$2x^2 - 12x + 2 + 2x - 2 = 0$$

$$2x^2 - 10x = 0$$

$$2x(x-5) = 0$$

$$2x = 0 \quad ; \quad x - 5 = 0$$

$$x = 0 \quad ; \quad x = 5$$

when $x = 0$, $y = -2 \times 0 + 2$
 $= 2$.

when $x = 5$, $y = -2 \times 5 + 2$
 $= -8$

$$\begin{aligned} (x-3)^2 &= (x-3)(x-3) \\ &= x^2 - 3x - 3x + 9 \\ &= x^2 - 6x + 9 \end{aligned}$$

9. Area of rectangle $A = lb$

$$= (2x+1)(3x-1)$$

$$= 6x^2 - 2x + 3x - 1$$

$$= 6x^2 + x - 1$$

Perimeter of $B = 2(l+b)$

$$= 2(2x+1 + x + \frac{1}{2})$$

$$= 2(3x + 1.5)$$

$$= 6x + 3$$

$$6x^2 + x - 1 = 6x + 3 \quad (\text{given})$$

$$6x^2 + x - 1 - 6x - 3 = 0$$

$$6x^2 - 5x - 4 = 0$$

$$x = \frac{(-5) \pm \sqrt{(-5)^2 - 4 \times 6 \times (-4)}}{2 \times 6}$$

$$| a = 6, b = -5, c = -4$$

$$= 1.33, \quad -\frac{1}{2}$$

16. Area of $A = \pi r^2$
 $= \pi(3p-1)^2$

Circumference of $B = 2\pi r$
 $= 2\pi(p+2)$

$\pi(3p-1)^2 = 2\pi(p+2)$
 $9p^2 - 6p + 1 = 2p + 4$

$9p^2 - 6p + 1 - 2p - 4 = 0$

$9p^2 - 8p - 3 = 0$

$a = 9, b = -8, c = -3$

$(3p-1)^2 = (3p-1)(3p-1)$ $= 9p^2 - 3p - 3p + 1$ $= 9p^2 - 6p + 1$
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$p = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \frac{-(-8) \pm \sqrt{(-8)^2 - 4 \times 9 \times (-3)}}{2 \times 9}$

$= 1.17, -0.28$