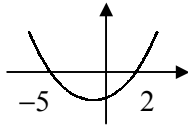


1  $x^2 + 3x + 2 \leq 12$   
 $x^2 + 3x - 10 \leq 0$   
 $(x + 5)(x - 2) \leq 0$   
 $-5 \leq x \leq 2$

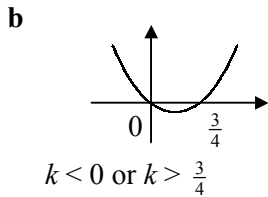


2 **a**  $= 8\sqrt{2} - 2\sqrt{2} = 6\sqrt{2}$   
**b**  $= x + 12\sqrt{x} + 36 + 4x - 12\sqrt{x} + 9$   
 $= 5x + 45$

3 **a**  $(-2, 0) \Rightarrow 0 = 8 - 2p + q$  (1)  
 $(3, 0) \Rightarrow 0 = 18 + 3p + q$  (2)  
 $(2) - (1) \Rightarrow 0 = 10 + 5p \Rightarrow p = -2$   
sub.  $\Rightarrow q = -12$   
**b**  $x\text{-coord} = \frac{-2+3}{2} = \frac{1}{2}$   
 $\therefore y = -\frac{25}{2} \Rightarrow (\frac{1}{2}, -\frac{25}{2})$

4  $2x - 2\sqrt{32} = \sqrt{98} - x$   
 $3x = 2\sqrt{32} + \sqrt{98}$   
 $3x = 8\sqrt{2} + 7\sqrt{2}$   
 $3x = 15\sqrt{2}$   
 $x = 5\sqrt{2}$

5 **a** real and distinct roots  
 $\therefore b^2 - 4ac > 0$   
 $16k^2 - 12k > 0$   
 $4k^2 - 3k > 0$   
 $k(4k - 3) > 0$

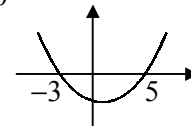


6  $(2^2)^{2x} = 2^{y-1}$   
 $4x = y - 1$  (1)  
 $(3^2)^{4x} = 3^{y+1}$   
 $8x = y + 1$  (2)

(1) and (2)  $\Rightarrow y = 4x + 1 = 8x - 1$   
 $4x = 2$   
 $x = \frac{1}{2}, y = 3$

7 **a**  $\text{LHS} = (x - \frac{7}{2})^2 - \frac{49}{4} + 9$   
 $= (x - \frac{7}{2})^2 - \frac{13}{4}$   
 $\therefore a = -\frac{7}{2}, b = -\frac{13}{4}$   
**b**  $x = \frac{7}{2}$

8 **a**  $(y + 3)(y - 5) < 0$



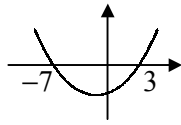
$-3 < y < 5$   
**b**  $x(2 - x) = 4(x - 3)$   
 $x^2 + 2x - 12 = 0$   
 $x = \frac{-2 \pm \sqrt{4 + 48}}{2} = \frac{-2 \pm 2\sqrt{13}}{2}$   
 $x = -1 \pm \sqrt{13}$

9  $2^{x^2+2} = (2^3)^x$   
 $x^2 + 2 = 3x$   
 $x^2 - 3x + 2 = 0$   
 $(x - 1)(x - 2) = 0$   
 $x = 1$  or  $2$

10 **a**  $t - 2t^2 = 3t - 15$   
 $2t^2 + 2t - 15 = 0$   
 $t = \frac{-2 \pm \sqrt{4 + 120}}{4} = \frac{-2 \pm \sqrt{124}}{4} = \frac{-2 \pm 2\sqrt{31}}{4}$   
 $t = \frac{1}{2}(-1 \pm \sqrt{31})$   
**b**  $(x^2 + 2)(x^2 - 3) = 0$   
 $x^2 = -2$  [no solutions] or  $3$   
 $x = \pm\sqrt{3}$

11  $x^2 + 4x - 21 \geq 0$   
 $(x + 7)(x - 3) \geq 0$

$$x \leq -7 \text{ or } x \geq 3$$



12 a  $3^{2x+2} = 3^2(3^x)^2 = 9y^2$   
 b  $9y^2 - 10y + 1 = 0$   
 $(9y - 1)(y - 1) = 0$   
 $y = 3^x = \frac{1}{9}, 1$   
 $\therefore x = -2, 0$

13 a  $= \sqrt{25 \times 3} = \sqrt{75}$

b  $\sqrt{64} < \sqrt{75} < \sqrt{81}$

$$\therefore 8 < 5\sqrt{3} < 9$$

$$\therefore n = 8$$

14  $y = \frac{2x+7}{3}$

sub.  $2x^2 - \left(\frac{2x+7}{3}\right)^2 - 7 = 0$

$$18x^2 - (2x+7)^2 - 63 = 0$$

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

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

$$x = -2 \text{ or } 4$$

$$\therefore x = -2, y = 1 \text{ or } x = 4, y = 5$$

15 a  $= \sqrt{\frac{48}{12}} - \sqrt{\frac{600}{12}}$   
 $= \sqrt{4} - \sqrt{50}$   
 $= 2 - 5\sqrt{2}$

b  $= \frac{\sqrt{2}}{4+3\sqrt{2}} \times \frac{4-3\sqrt{2}}{4-3\sqrt{2}} = \frac{\sqrt{2}(4-3\sqrt{2})}{16-18}$   
 $= -\frac{1}{2}(4\sqrt{2} - 6)$   
 $= 3 - 2\sqrt{2}$

16 a  $5^{x+1} = (5^2)^{y-3}$

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

$$y = \frac{x+7}{2}$$

b  $(4^2)^{x-1} = 4^z$

$$2x - 2 = z$$

$$x = 2y - 7 \quad \therefore z = 2(2y - 7) - 2$$

$$z = 4y - 16$$

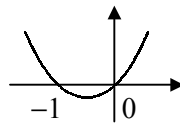
17 a  $(x - k)^2 - k^2 - k = 0$

$$x - k = \pm \sqrt{k^2 + k}$$

$$x = k \pm \sqrt{k^2 + k}$$

b real roots  $\therefore k^2 + k \geq 0$

$$k(k+1) \geq 0$$



$$k \leq -1 \text{ or } k \geq 0$$

18 a  $\frac{1}{y} - y = \frac{3}{2}$

$$2 - 2y^2 = 3y$$

$$2y^2 + 3y - 2 = 0$$

b  $(2y - 1)(y + 2) = 0$

$$y = -2, \frac{1}{2}$$

$$x = y^5 = -32, \frac{1}{32}$$