1 **a** $2^{x-1} = 2^4$

$x - 1 = 4$

$x = 5$

b $3^y - 10 = 17$

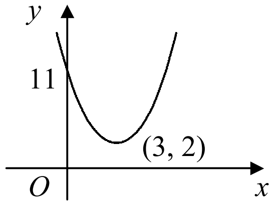
$3^y = 27$

$y = 3$

2 **a** $= (x-3)^2 - 9 + 11$

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

b



3 **a** $= (\frac{49}{4})^{-\frac{1}{2}} = \sqrt{\frac{4}{49}} = \frac{2}{7}$

b $3x^{-3} = \frac{64}{9}$

$x^3 = \frac{27}{64}$

$x = \sqrt[3]{\frac{27}{64}} = \frac{3}{4}$

4 $2x\sqrt{3} + 9 = x\sqrt{3}$

$x\sqrt{3} = -9$

$x = \frac{-9}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = -3\sqrt{3}$

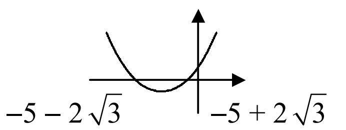
5 **a** $x = \frac{-10 \pm \sqrt{100 - 52}}{2}$

$= \frac{-10 \pm \sqrt{48}}{2}$

$= \frac{-10 \pm 4\sqrt{3}}{2}$

$= -5 \pm 2\sqrt{3}$

b



$x < -5 - 2\sqrt{3}$ or $x > -5 + 2\sqrt{3}$

6 **a** $42x - 49 = 9x^2$

$9x^2 - 42x + 49 = 0$

$(3x - 7)^2 = 0$

$x = \frac{7}{3}$

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

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

$(2y + 3)(y - 1) = 0$

$y = -\frac{3}{2}$ or 1

7 $y = x + 3$

sub.

$3x^2 - 2x(x + 3) + (x + 3)^2 - 17 = 0$

$x^2 = 4$

$x = \pm 2$

$\therefore\ x = -2, y = 1$ or $x = 2, y = 5$

8 **a** $x^{\frac{1}{2}} = \sqrt[3]{64} = 4$

$x = 4^2 = 16$

b $\frac{\sqrt{3}+1}{2\sqrt{3}-3} = \frac{\sqrt{3}+1}{2\sqrt{3}-3} \times \frac{2\sqrt{3}+3}{2\sqrt{3}+3} = \frac{(\sqrt{3}+1)(2\sqrt{3}+3)}{12-9}$

$= \frac{1}{3}(6 + 3\sqrt{3} + 2\sqrt{3} + 3)$

$= 3 + \frac{5}{3}\sqrt{3}$

$\therefore\ a = 3,\ b = \frac{5}{3}$

9 **a** let A be $(2, 4)$

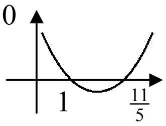
$\therefore\ AP^2 = (2k - 2)^2 + (k - 4)^2$

$AP < 3\ \therefore\ (2k - 2)^2 + (k - 4)^2 < 9$

$5k^2 - 16k + 11 < 0$

b $(5k - 11)(k - 1) < 0$

$1 < k < \frac{11}{5}$



10 **a** $2x \le 7$

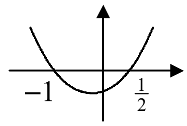
$x \le \frac{7}{2}$

b $2x^2 + x < 1$

$2x^2 + x - 1 < 0$

$(2x - 1)(x + 1) < 0$

$-1 < x < \frac{1}{2}$



11 **a** $\text{f}(x) = 2[x^2 - 4x] + 5$

$= 2[(x-2)^2 - 4] + 5$

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

b $(2, -3)$

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

$x - 2 = \pm\sqrt{\frac{3}{2}}$

$x = 2 \pm \frac{\sqrt{3}}{\sqrt{2}} \times \frac{\sqrt{2}}{\sqrt{2}}$

$x = 2 \pm \frac{1}{2}\sqrt{6}$

12 **a** $= 2\sqrt{3} - \frac{5}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}}$

$= 2\sqrt{3} - \frac{5}{3}\sqrt{3}$

$= \frac{1}{3}\sqrt{3}$

b $= \frac{64x\sqrt{x}}{16x}$

$= 4\sqrt{x}$

13 no real roots

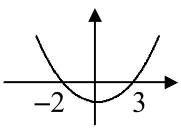
$\therefore\ b^2 - 4ac < 0$

$4k^2 - 4(k+6) < 0$

$k^2 - k - 6 < 0$

$(k+2)(k-3) < 0$

$-2 < k < 3$



14 **a** $AM = \frac{1}{2}AC = 2 + 2\sqrt{3}$

$BM^2 = AB^2 - AM^2$

$= (4 + \sqrt{3})^2 - (2 + 2\sqrt{3})^2$

$= 16 + 8\sqrt{3} + 3 - (4 + 8\sqrt{3} + 12) = 3$

$\therefore\ BM = \sqrt{3}$

b $= \frac{1}{2} \times AC \times BM$

$= \frac{1}{2} \times (4 + 4\sqrt{3}) \times \sqrt{3}$

$= \frac{1}{2}(4\sqrt{3} + 12) = 6 + 2\sqrt{3}$

15 $(2^2)^{2y+7} = (2^3)^{y+3}$

$4y + 14 = 3y + 9$

$y = -5$

16 $\text{LHS} = x^2(2x^2 - 3x - 9) - x(2x^2 - 3x - 9)$

$+ 3(2x^2 - 3x - 9)$

$= 2x^4 - 3x^3 - 9x^2 - 2x^3 + 3x^2 + 9x$

$+ 6x^2 - 9x - 27$

$= 2x^4 - 5x^3 - 27$

$\therefore\ A = 2,\ B = -5$ and $C = -27$

17 **a** $x^2 + 4x + k = 0$

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

$x + 2 = \pm\sqrt{4-k}$

$x = -2 \pm \sqrt{4-k}$

b real roots only if $4 - k \geq 0$

$\therefore\ k \leq 4$

c $k = -4$

$\therefore\ x = -2 \pm \sqrt{8}$

$x = -2 \pm 2\sqrt{2}$