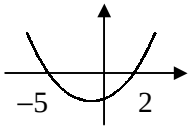
1 $x^2 + 3x + 2 \le 12$

$x^2 + 3x - 10 \le 0$

$(x + 5)(x - 2) \le 0$



$-5 \le x \le 2$

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) $0 = 10 + 5p \Rightarrow p = -2$

sub. $\Rightarrow q = -12$

b x-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

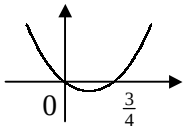
$\therefore b^2 - 4ac > 0$

$16k^2 - 12k > 0$

$4k^2 - 3k > 0$

$k(4k - 3) > 0$

b



$k < 0$ or $k > \frac{3}{4}$

6 $(2^2)^{2x} = 2^{y-1}$

$4x = y - 1$ (1)

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

$8x = y + 1$ (2)

(1) and (2) $\Rightarrow$ $y = 4x + 1 = 8x - 1$

$4x = 2$

$x = \frac{1}{2}, y = 3$

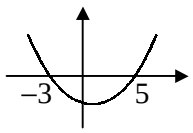
7 **a** LHS $= (x - \frac{7}{2})^2 - \frac{49}{4} + 9$

$= (x - \frac{7}{2})^2 - \frac{13}{4}$

$\therefore a = -\frac{7}{2}, b = -\frac{13}{4}$

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

$x = \pm\sqrt{3}$

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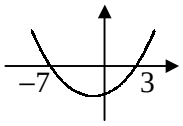
11 $x^2 + 4x - 21 \geq 0$

$(x + 7)(x - 3) \geq 0$



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

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

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

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

$x = -2$ or 4

$\therefore\ x = -2, y = 1$ 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 $(4^2)^{x-1} = 4^z$

$2x - 2 = z$

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

$z = 4y - 16$

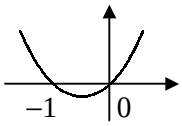
17 **a** $(x - k)^2 - k^2 - k = 0$

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

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

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

$k(k + 1) \geq 0$



$k \leq -1$ or $k \geq 0$

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

$2 - 2y^2 = 3y$

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

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

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

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

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