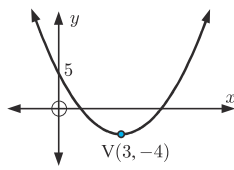
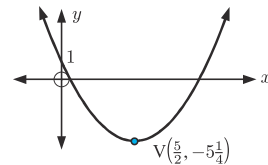
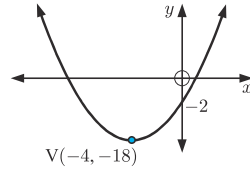


g $y = (x - 3)^2 - 4$

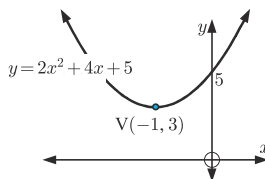


i $y = (x - \frac{5}{2})^2 - 5\frac{1}{4}$

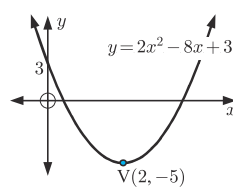
h $y = (x + 4)^2 - 18$



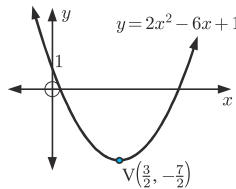
- 2 a** **i** $y = 2(x + 1)^2 + 3$
ii $(-1, 3)$ **iii** 5
iv



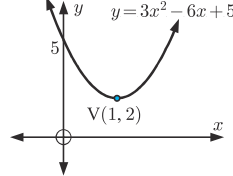
- b** **i** $y = 2(x - 2)^2 - 5$
ii $(2, -5)$ **iii** 3
iv



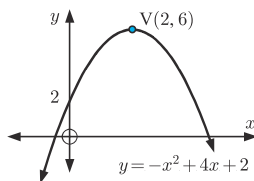
- c** **i** $y = 2(x - \frac{3}{2})^2 - \frac{7}{2}$
ii $(\frac{3}{2}, -\frac{7}{2})$ **iii** 1
iv



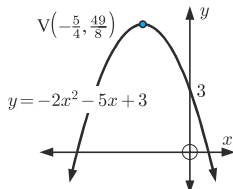
- d** **i** $y = 3(x - 1)^2 + 2$
ii $(1, 2)$ **iii** 5
iv



- e** **i** $y = -(x - 2)^2 + 6$
ii $(2, 6)$ **iii** 2
iv



- f** **i** $y = -2(x + \frac{5}{4})^2 + \frac{49}{8}$
ii $(-\frac{5}{4}, \frac{49}{8})$ **iii** 3
iv



- 3 a** $y = (x - 2)^2 + 3$ **b** $y = (x + 3)^2 - 6$
c $y = -(x - 2)^2 + 9$ **d** $y = 2(x + \frac{3}{2})^2 - \frac{17}{2}$
e $y = -2(x + \frac{5}{2})^2 + \frac{27}{2}$ **f** $y = 3(x - \frac{3}{2})^2 - \frac{47}{4}$

EXERCISE 1C.3

- 1 a** cuts x -axis twice, concave up
b cuts x -axis twice, concave up
c lies entirely below the x -axis, concave down, negative definite
d cuts x -axis twice, concave up
e touches x -axis, concave up

- f** cuts x -axis twice, concave down
g cuts x -axis twice, concave up
h cuts x -axis twice, concave down
i touches x -axis, concave up

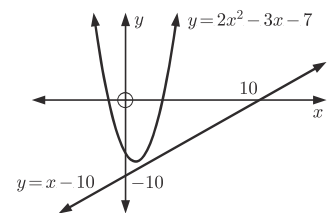
- 2 a** $a = 1$ which is > 0 and $\Delta = -15$ which is < 0 so is entirely above the x -axis.
b $a = -1$ which is < 0 and $\Delta = -8$ which is < 0 so is entirely below the x -axis.
c $a = 2$ which is > 0 and $\Delta = -40$ which is < 0 so is entirely above the x -axis.
d $a = -2$ which is < 0 and $\Delta = -23$ which is < 0 so is entirely below the x -axis.
3 a $a = 3$ which is > 0 and $\Delta = k^2 + 12$ which is always > 0 {as $k^2 \geq 0$ for all k } \therefore always cuts x -axis twice.
4 $-4 < k < 4$

EXERCISE 1D

- 1 a** $y = 2(x - 1)(x - 2)$ **b** $y = 2(x - 2)^2$
c $y = (x - 1)(x - 3)$ **d** $y = -(x - 3)(x + 1)$
e $y = -3(x - 1)^2$ **f** $y = -2(x + 2)(x - 3)$
2 a $y = \frac{3}{2}(x - 2)(x - 4)$ **b** $y = -\frac{1}{2}(x + 4)(x - 2)$
c $y = -\frac{4}{3}(x + 3)^2$
3 a $y = 3x^2 - 18x + 15$ **b** $y = -4x^2 + 6x + 4$
c $y = -x^2 + 6x - 9$ **d** $y = 4x^2 + 16x + 16$
e $y = \frac{3}{2}x^2 - 6x + \frac{9}{2}$ **f** $y = -\frac{1}{3}x^2 + \frac{2}{3}x + 5$
4 a $y = -(x - 2)^2 + 4$ **b** $y = 2(x - 2)^2 - 1$
c $y = -2(x - 3)^2 + 8$ **d** $y = \frac{2}{3}(x - 4)^2 - 6$
e $y = -2(x - 2)^2 + 3$ **f** $y = 2(x - \frac{1}{2})^2 - \frac{3}{2}$

EXERCISE 1E

- 1 a** $(1, 7)$ and $(2, 8)$ **b** $(4, 5)$ and $(-3, -9)$
c $(3, 0)$ (touching) **d** graphs do not meet
2 a $(0.586, 5.59)$ and $(3.41, 8.41)$ **b** $(3, -4)$ touching
c graphs do not meet **d** $(-2.56, -18.8)$ and $(1.56, 1.81)$
3 a **i** $(-1, 1)$ and $(2, 4)$ **ii** $x < -1$ or $x > 2$
b **i** $(-2, -3)$ and $(1, 0)$ **ii** $x < -2$ or $x > 1$
c **i** $(1, 4)$ **ii** $x \in \mathbb{R}, x \neq 1$
d **i** $(-4, -1)$ and $(1, 4)$ **ii** $x < -4$ or $x > 1$
4 $c = -9$
5 $m = 0$ or -8
6 -1 or 11
7 a $c < -9$
b example: $c = -10$



EXERCISE 1F

- 1** 7 and -5 or -7 and 5 **2** 5 or $\frac{1}{5}$ **3** 14
4 18 and 20 or -18 and -20 **5** 15 and 17 or -15 and -17
6 15 sides **7** 3.48 cm
8 b 6 cm by 6 cm by 7 cm **9** 11.2 cm square **10** no
12 61.8 km h⁻¹ **13** 32
14 b The graph is a parabola. **c** 21.25 m
d $f(x) = -0.05x^2 + 2x + 1.25$ **e** yes
15 a $y = -\frac{8}{9}x^2 - 8$