

**Quadratics**

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**Exercise A**

Workout the value of the discriminant of each of the following quadratic expressions:

1.  $x^2 + 5x + 2$

2.  $2x^2 + 4x + 1$

3.  $4x^2 - 3x + 5$

4.  $-x^2 - 4x - 3$

5.  $p^2 - 6p - 5$

6.  $x^2 - 7x$ 

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**Exercise B**

Use the discriminant to determine the number of real roots of each of the following quadratic equations:

1.  $x^2 + 4x + 3 = 0$

2.  $2x^2 - 6x + 20 = 0$

3.  $x^2 + 6x + 9 = 0$

4.  $3x^2 - x - 13 = 0$

5.  $t^2 - 4t + 16 = 0$

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

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**Exercise C**

1. The quadratic equation  $2x^2 - 6x + k = 0$ , where  $k$  is a constant, has repeated real roots. Find the value of  $k$ .

2. (a) Find the discriminant of  $kx^2 - 4x + k$  in terms of  $k$ .

(b) The quadratic equation  $kx^2 - 4x + k = 0$  has equal roots. Find the possible values of  $k$ .

3.

(i) Calculate the discriminant of  $-2x^2 + 7x + 3$  and hence state the number of real roots of the equation  $-2x^2 + 7x + 3 = 0$ . [3]

(ii) The quadratic equation  $2x^2 + (p + 1)x + 8 = 0$  has equal roots. Find the possible values of  $p$ . [4]

4.

The equation  $kx^2 + 4x + (5 - k) = 0$ , where  $k$  is a constant, has 2 different real solutions for  $x$ .

(a) Show that  $k$  satisfies

$$k^2 - 5k + 4 > 0.$$

(3)

(b) Hence find the set of possible values of  $k$ .

(4)

5. Given that the quadratic equation  $2x^2 + 6x - k = 0$  has two distinct real roots, find the possible set of values of the constant  $k$ .
6. The quadratic equation  $x^2 + 4x - 2m = 0$  has no real solutions. Find the possible range of values of  $m$ .
7. (a) Find the discriminant of the quadratic expression  $px^2 - 3x + 5$  in terms of  $p$ .
- (b) Hence find the set of possible values of  $p$  for which the quadratic equation  $px^2 - 3x + 5 = 0$  has no solutions.
8. Find the value of the constant  $q$  such that the quadratic equation  $qx^2 - 6x + q = 0$  has equal roots.
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### Exercise D

Sketch each of the following quadratic graphs.

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|---------------------------|------------------------|--------------------------|
| 1. $y = x^2 - 8x + 12$    | 2. $y = x^2 + 6x + 5$  | 3. $y = x^2 - 5x - 14$   |
| 4. $y = x^2 - 4x + 1$     | 5. $y = x^2 + 10x - 3$ | 6. $y = x^2 - 5x$        |
| 7. $y = 2x^2 - x - 3$     | 8. $y = 3x^2 - 4x - 4$ | 9. $y = 2x^2 - 12x$      |
| 10. $y = x^2 - 9$         | 11. $y = x^2 - 25$     | 12. $y = 2x^2 - 15$      |
| 13. $y = x^2 + 2x + 10$   | 14. $y = x^2 - x + 5$  | 15. $y = -x^2 + 4x - 20$ |
| 16. $y = -2x^2 + 3x - 15$ |                        |                          |
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### Exercise E

Solve the following equations:

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|---------------------------------|------------------------------|--------------------------|
| 1. $x^4 - 5x^2 + 4 = 0$         | 2. $x^4 - 3x^2 - 10 = 0$     | 3. $2x^6 + 9x^3 + 4 = 0$ |
| 4. $2x^{1/2} - x^{1/4} - 3 = 0$ | 5. $3x^{1/3} - 9x^{1/6} = 0$ |                          |
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