

Describe the roots of each of the following.

1. $f(x) = x^2 + 3x - 8$

$$A = 1, B = 3, C = -8$$

$$D = B^2 - 4AC$$

$$D = (3)^2 - 4(1)(-8)$$

$$D = 9 + 32$$

$$D = 42$$

$$\sqrt{42} \approx 6.48$$

Two real, irrational roots

2. $f(x) = 2x^2 + 12x + 18$

$$A = 2, B = 12, C = 18$$

$$D = B^2 - 4AC$$

$$D = (12)^2 - 4(2)(18)$$

$$D = 144 - 144$$

$$D = 0$$

One real, rational root

3. $f(x) = x^2 + x + 9$

$$A = 1, B = 1, C = 9$$

$$D = B^2 - 4AC$$

$$D = (1)^2 - 4(1)(9)$$

$$D = 1 - 36$$

$$D = -35$$

Two imaginary roots

4. $f(x) = -x^2 + 4x - 2$

$$A = -1, B = 4, C = -2$$

$$D = B^2 - 4AC$$

$$D = (4)^2 - 4(-1)(-2)$$

$$D = 16 + 8$$

$$D = 24$$

$$\sqrt{24} = 2\sqrt{6} \approx 4.90$$

Two real, irrational roots

5. $f(x) = x^2 + 5x + 6$

$$A = 1, B = 5, C = 6$$

$$D = B^2 - 4AC$$

$$D = (5)^2 - 4(1)(6)$$

$$D = 25 - 24$$

$$D = 1$$

$$\sqrt{1} = 1$$

Two real, rational roots

6. $f(x) = 3x^2 + 5x - 4$

$$A = 3, B = 5, C = -4$$

$$D = B^2 - 4AC$$

$$D = (5)^2 - 4(3)(-4)$$

$$D = 25 + 48$$

$$D = 73$$

$$\sqrt{73} \approx 8.54$$

Two real, irrational roots

Nature of Roots 1 of 3 – The Discriminant

7. $f(x) = 3x^2 + 5x + 5$

$A = 3, B = 5, C = 5$

$D = B^2 - 4AC$

$D = (5)^2 - 4(3)(5)$

$D = 25 - 64$

$D = -39$

Two imaginary roots

8. $f(x) = 4x^2 + 20x + 25$

$A = 4, B = 20, C = 25$

$D = B^2 - 4AC$

$D = (20)^2 - 4(4)(25)$

$D = 400 - 400$

$D = 0$

One real, rational root

9. $f(x) = 5x^2 + 4x - 2$

$A = 5, B = 4, C = -2$

$D = B^2 - 4AC$

$D = (4)^2 - 4(5)(-2)$

$D = 16 + 40$

$D = 56$

$\sqrt{56} = 2\sqrt{14} \approx 7.48$

Two real, irrational roots

10. $f(x) = 2x^2 - 4x - 6$

$A = 2, B = -4, C = -6$

$D = B^2 - 4AC$

$D = (-4)^2 - 4(2)(-6)$

$D = 16 + 48$

$D = 64$

$\sqrt{64} = 8$

Two real, rational roots