EXERCISE 2.2 PAGE: 33

1. Find the zeroes of the following quadratic polynomials and verify the relationship between the zeroes and the coefficients.

Solutions:

(i) x^2–2x –8

⇒x^2– 4x+2x–8 = x(x–4)+2(x–4) = (x-4)(x+2)

Therefore, zeroes of polynomial equation x^2–2x–8 are (4, -2)

Sum of zeroes = 4–2 = 2 = -(-2)/1 = -(Coefficient of x)/(Coefficient of x^2)

Product of zeroes = 4×(-2) = -8 =-(8)/1 = (Constant term)/(Coefficient of x^2)

(ii) $4s^2$–4s+1

⇒$4s^2$–2s–2s+1 = 2s(2s–1)–1(2s-1) = (2s–1)(2s–1)

Therefore, zeroes of polynomial equation $4s^2$–4s+1 are (1/2, 1/2)

Sum of zeroes = (½)+(1/2) = 1 = -(-4)/4 = -(Coefficient of s)/(Coefficient of s^2)

Product of zeros = (1/2)×(1/2) = 1/4 = (Constant term)/(Coefficient of s^2)

(iii) $6x^2$–3–7x

⇒$6x^2$–7x–3 = $6x^2$– 9x + 2x – 3 = 3x(2x – 3) +1(2x – 3) = (3x+1)(2x-3)

Therefore, zeroes of polynomial equation $6x^2$–3–7x are (-1/3, 3/2)

Sum of zeroes = -(1/3)+(3/2) = (7/6) = -(Coefficient of x)/(Coefficient of x^2)

Product of zeroes = -(1/3)×(3/2) = -(3/6) = (Constant term) /(Coefficient of x^2)

(iv) $4u^2$+8u

⇒ 4u(u+2)

Therefore, zeroes of polynomial equation $4u^2$ + 8u are (0, -2).

Sum of zeroes = 0+(-2) = -2 = -(8/4) = = -(Coefficient of u)/(Coefficient of u^2)

Product of zeroes = 0×-2 = 0 = 0/4 = (Constant term)/(Coefficient of u^2)

(v) t^2–15

⇒ t^2 = 15 or t = ±√15

Therefore, zeroes of polynomial equation t^2 –15 are (√15, -√15)

Sum of zeroes =√15+(-√15) = 0= -(0/1)= -(Coefficient of t) / (Coefficient of t^2)

Product of zeroes = √15×(-√15) = -15 = -15/1 = (Constant term) / (Coefficient of t^2)

(vi) $3x^2$–x–4

⇒ $3x^2$–4x+3x–4 = x(3x-4)+1(3x-4) = (3x – 4)(x + 1)

Therefore, zeroes of polynomial equation$3x^2$ – x – 4 are (4/3, -1)

Sum of zeroes = (4/3)+(-1) = (1/3)= -(-1/3) = -(Coefficient of x) / (Coefficient of x^2)

Product of zeroes=(4/3)×(-1) = (-4/3) = (Constant term) /(Coefficient of x^2)

2. Find a quadratic polynomial each with the given numbers as the sum and product of its zeroes, respectively.

(i) 1/4 , -1

Solution:

From the formulas of sum and product of zeroes, we know,

Sum of zeroes = $\alpha+\beta$

Product of zeroes = $\alpha\ \beta$

Sum of zeroes = $\alpha+\beta$ = 1/4

Product of zeroes = $\alpha\ \beta$ = -1

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2-(\alpha+\beta)x+\alpha\beta = 0$

$x^2-(1/4)x+(-1) = 0$

$4x^2-x-4 = 0$

Thus, $4x^2-x-4$ is the quadratic polynomial.

(ii)√2, 1/3

Solution:

Sum of zeroes = $\alpha + \beta = \sqrt{2}$

Product of zeroes = $\alpha\ \beta$ = 1/3

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2-(\alpha+\beta)x+\alpha\beta = 0$

$x^2-(\sqrt{2})x+(1/3) = 0$

$3x^2-3\sqrt{2}x+1 = 0$

Thus, $3x^2-3\sqrt{2}x+1$ is the quadratic polynomial.

(iii) 0, √5

Solution:

Given,

Sum of zeroes = $\alpha+\beta = 0$

Product of zeroes = $\alpha\ \beta = \sqrt{5}$

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2-(\alpha+\beta)x+\alpha\beta = 0$

$x^2-(0)x+\sqrt{5}= 0$

Thus, $x^2+\sqrt{5}$ is the quadratic polynomial.

(iv) 1, 1

Solution:

Given,

Sum of zeroes = $\alpha+\beta = 1$

Product of zeroes = $\alpha\ \beta = 1$

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2-(\alpha+\beta)x+\alpha\beta = 0$

$x^2-x+1 = 0$

Thus, x^2-x+1 is the quadratic polynomial.

(v) -1/4, 1/4

Solution:

Given,

Sum of zeroes = $\alpha+\beta = -1/4$

Product of zeroes = $\alpha\ \beta = 1/4$

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2-(\alpha+\beta)x+\alpha\beta = 0$

$x^2-(-1/4)x+(1/4) = 0$

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

Thus, $4x^2+x+1$ is the quadratic polynomial.

(vi) 4, 1

Solution:

Given,

Sum of zeroes = $\alpha+\beta = 4$

Product of zeroes = $\alpha\beta = 1$

∴ If α and β are zeroes of any quadratic polynomial, then the quadratic polynomial equation can be written directly as:-

$x^2-(\alpha+\beta)x+\alpha\beta = 0$

$x^2-4x+1 = 0$

Thus, x^2-4x+1 is the quadratic polynomial.