VIP

CHAPTER 1

MATH-123

ELECTRICAL / ELECTRONICS

DERIVATION OF QUADRATIC FORMULA

Method:

To solve the quadratic equation by Using Quadratic formula:

Step I: Write the Quadratic Equation in Standard form.

Step II: By comparing this equation with standard form $ax^2 + b\,x + c = 0$ to identify the values of a , b , c.

Step III: Putting these values of a, b, c in Quadratic formula

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$ and solve for x.

Example 5:

Solve the equation $3x^2 + 5x = 2$

Step-I:

$$3x^2+5x-2 = 0$$

Step-II: $ax^2+bx+c=0$

$a=3$, $b=5$, $c=-2$

Step-III:

$$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

$$x = \frac{-(5) \pm \sqrt{(5)^2-4(3)(-2)}}{2(3)}$$

$$x = \frac{-5 \pm \sqrt{25+24}}{6}$$

$$x = \frac{-5 \pm \sqrt{49}}{6}$$

$$x = \frac{-5 \pm 7}{6}$$

$$x = \frac{-5+7}{6} \qquad x = \frac{-5-7}{6}$$

$$x = \frac{2}{6_3} \qquad x = \frac{-12^{-2}}{6}$$

$$x = \frac{1}{3} \qquad x = -2$$

$$S.S = \{-2, 1/3\}$$

Example 6:

Solve the equation $15x^2 - 2ax - a^2 = 0$ by using Quadratic formula:

$(15)x^2 + (-2a)x + (-a^2) = 0$

$a = 15, \quad b = -2a, \quad c = -a^2$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Putting the values of a, b & c in above quadratic formula

$$x = \frac{-(-2a) \pm \sqrt{(-2a)^2 - 4(15)(-a^2)}}{2(15)}$$

$$x = \frac{2a \pm \sqrt{4a^2 + 60a^2}}{30}$$

$$x = \frac{2a \pm \sqrt{64a^2}}{30}$$

$$x = \frac{2a \pm 8a}{30}$$ ✓

$$x = \frac{2a(1 \pm 4)}{30_{15}}$$

$$x = \frac{a(1 \pm 4)}{15}$$ ✓

$$x = \frac{2a \pm \sqrt{64a^2}}{30}$$

$$x = \frac{2a \pm 8a}{30}$$ ✓

$$x = \frac{2a(1 \pm 4)}{30_{15}}$$

$$x = \frac{a(1 \pm 4)}{15}$$ ✓

$$x = \frac{a(1+4)}{15}$$

$$x = \frac{a(5)}{15_3}$$

$$x = \frac{a}{3}$$

$$x = \frac{a(1-4)}{15}$$

$$x = \frac{a(-5)}{15_5}$$

$$x = \frac{-a}{5}$$

$$S.S = \left\{ a/3 , -a/5 \right\}$$

Example 7:

Solve the equation $\frac{1}{2x-5}+\frac{5}{2x-1}=2$ by using Quadratic formula.

LCM = $(2x-5)(2x-1)$

$\left[\frac{1}{(2x-5)}\right]+\left[\frac{5}{(2x-1)}\right]=[2]$

Multiplying the equation by LCM $(2x-5)(2x-1)$

$(2x-5)(2x-1)\left[\frac{1}{(2x-5)}\right]+(2x-5)(2x-1)\left[\frac{5}{(2x-1)}\right]=(2)(2x-5)(2x-1)$

$(2x-1)+(2x-5)(5)=(2)(4x^2-2x-10x+5)$

$2x-1+10x-25=8x^2-4x-20x+10$

$12x-26=8x^2-24x+10$

$8x^2-24x+10=12x-26$

$12x-26=8x^2-24x+10$

$8x^2-24x+10=12x-26$

$8x^2-24x+10-12x+26=0$

$8x^2-36x+36=0$

$4(2x^2-9x+9)=0$

$2x^2-9x+9=0$

$a=2,\ b=-9,\ c=9$

$x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$

$x=\frac{-(-9)\pm\sqrt{(-9)^2-4(2)(9)}}{2(2)}$

$x=\frac{9\pm\sqrt{81-72}}{4}$

$x=\frac{9\pm\sqrt{9}}{4}$

$x=\frac{9\pm3}{4}$

$x=\frac{9+3}{4}$ | $x=\frac{9-3}{4}$

$x=\frac{12}{4}^{3}$ | $x=\frac{6}{4}^{3}_{2}$

$x=3$ | $x=\frac{3}{2}$

$S.S=\{3,\ 3/2\}$