

7.3 Solving Equations Using Quadratic Techniques

Objective: Use Quadratic techniques to solve equations

I. Solve using Quadratic Techniques

Ex1) $x^4 - 13x^2 + 36 = 0$

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

$$x^2 - 9 = 0 \quad x^2 - 4 = 0$$

$$\sqrt{x^2} = \sqrt{9} \quad \sqrt{x^2} = \sqrt{4}$$

$$x = \pm 3 \quad x = \pm 2$$

Ex2) $x^4 - 29x^2 + 100 = 0$

$$(x^2)^2 - 29(x^2) + 100 = 0$$

$$(x^2 - 25)(x^2 - 4) = 0$$

$$x^2 - 25 = 0 \quad x^2 - 4 = 0$$

$$x^2 = 25 \quad x^2 = 4$$

$$x = \pm 5 \quad x = \pm 2$$

7.3 Solving Equations Using Quadratic Techniques

Objective: Use Quadratic techniques to solve equations

I. Solve using Quadratic Techniques

Ex1) $x^4 - 13x^2 + 36 = 0$

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

$$x^2 - 9 = 0 \quad x^2 - 4 = 0$$

$$\sqrt{x^2} = \sqrt{9} \quad \sqrt{x^2} = \sqrt{4}$$

$$x = \pm 3 \quad x = \pm 2$$

Ex2) $x^4 - 29x^2 + 100 = 0$

$$(x^2)^2 - 29(x^2) + 100 = 0$$

$$(x^2 - 25)(x^2 - 4) = 0$$

$$x^2 - 25 = 0 \quad x^2 - 4 = 0$$

$$x^2 = 25 \quad x^2 = 4$$

$$x = \pm 5 \quad x = \pm 2$$

Ex3) $x^{2/3} - 6x^{1/3} + 5 = 0$

$$(x^{1/3})^2 - 6(x^{1/3}) + 5 = 0$$

$$(x^{1/3} - 5)(x^{1/3} - 1) = 0$$

$$x^{1/3} - 5 = 0 \quad x^{1/3} - 1 = 0$$

$$x^{1/3} = 5 \quad x^{1/3} = 1$$

$$x = 125 \quad x = 1$$

Both Answers

Ex4) $x^{1/2} - x^{1/4} - 6 = 0$

$$(x^{1/4})^2 - (x^{1/4}) - 6 = 0$$

$$(x^{1/4} - 2)(x^{1/4} - 3) = 0$$

$$x^{1/4} - 2 = 0 \quad x^{1/4} - 3 = 0$$

$$x^{1/4} = 2 \quad x^{1/4} = 3$$

$$x = 16 \quad x = 81$$

Not possible

Ex5) $x - 6\sqrt{x} = 7$

$$x - 6\sqrt{x} - 7 = 0$$

$$(\sqrt{x})^2 - 6(\sqrt{x}) - 7 = 0$$

$$(\sqrt{x} - 7)(\sqrt{x} + 1) = 0$$

$$\sqrt{x} - 7 = 0 \quad \sqrt{x} + 1 = 0$$

$$(\sqrt{x})^2 = 49 \quad (\sqrt{x})^2 = (-1)^2$$

$$x = 49 \quad x = 1$$

Check

Ex6) $x + \sqrt{x} = 12$

$$x + \sqrt{x} - 12 = 0$$

$$(\sqrt{x})^2 + (\sqrt{x}) - 12 = 0$$

$$(\sqrt{x} + 4)(\sqrt{x} - 3) = 0$$

$$\sqrt{x} + 4 = 0 \quad \sqrt{x} - 3 = 0$$

$$\sqrt{x} = -4 \quad \sqrt{x} = 3$$

$$x = 16 \quad x = 9$$

Not possible

Ex7) $x^3 + 343 = 0$

$$x^3 + 7^3 = 0$$

$$a = x \quad b = 7$$

$$(x+7)(x^2 - 7x + 49) = 0$$

Recall

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

Now Solve...

$$x+7=0 \quad x=-7$$

$$x = \frac{7 \pm \sqrt{49 - 4 \cdot 1 \cdot 49}}{2 \cdot 1}$$

$$x = \frac{7 \pm \sqrt{49 - 196}}{2} = \frac{7 \pm \sqrt{-147}}{2} = \frac{7 \pm i\sqrt{147}}{2}$$

17) $m^4 + 7m^3 + 12m^2 = 0$

$$m^2(m^2 + 7m + 12) = 0$$

$$m^2(m+4)(m+3) = 0$$

$$\sqrt{m^2} = 0 \quad m+4=0 \quad m+3=0$$

$$m=0 \quad m=-4 \quad m=-3$$