

1.4 Polynomial Equations WS

Solve.

KEY

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

$$x^2(x+1) + (x+1) = 0$$

$$(x^2+1)(x+1) = 0$$

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

$$x = \pm i \quad (x+1) = 0$$

$$x = \pm i, -1$$

$$2. 10x^3 + 20x^2 + x = -2$$

$$10x^3 + 20x^2 + x + 2 = 0$$

$$10x^2(x+2) + (x+2) = 0$$

$$(10x^2+1)(x+2) = 0$$

$$10x^2+1=0$$

$$10x^2 = -1$$

$$\sqrt{x^2} = \sqrt{\frac{-1}{10}}$$

$$x = \pm \frac{i\sqrt{10}}{10}$$

$$x = \pm \frac{i\sqrt{10}}{10}, -2$$

$$3. x^4 - 9 = 0$$

$$(x^2+3)(x^2-3) = 0$$

$$x^2+3=0 \quad x^2-3=0$$

$$x = \pm\sqrt{3}, \pm i\sqrt{3}$$

$$4. 2x^3 - 5x^2 + 18x - 45 = 0$$

$$x^2(2x-5) + 9(2x-5) = 0$$

$$(x^2+9)(2x-5) = 0$$

$$x^2+9=0$$

$$\sqrt{x^2} = \sqrt{-9}$$

$$x = \pm 3i$$

$$x = \pm 3i, \frac{5}{2}$$

$$5. x^3 - 8 = 0$$

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

$$\frac{-2 \pm \sqrt{4-4(1)(4)}}{2}$$

$$\frac{-2 \pm \sqrt{-12}}{2}$$

$$\frac{-2 \pm 2i\sqrt{3}}{2}$$

$$x = 2, -1 \pm i\sqrt{3}$$

$$6. x^3 + 3x^2 + 10x = -30$$

$$x^3 + 3x^2 + 10x + 30 = 0$$

$$x^2(x+3) + 10(x+3) = 0$$

$$(x^2+10)(x+3) = 0$$

$$\sqrt{x^2} = \sqrt{-10}$$

$$x = \pm i\sqrt{10}, -3$$

$$7. x^3 - 2x^2 + 4x - 8 = 0$$

$$x^2(x-2) \mid 4(x-2) = 0$$

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

$$\sqrt{x^2} = \sqrt{-4}$$

$$x = \pm 2i$$

$$X = \pm 2i, 2$$

$$8. 125x^3 - 8 = 0$$

$$(5x-2)(25x^2 + 10x + 4) = 0$$

$$\frac{-10 \pm \sqrt{100 - 4(25)(4)}}{50}$$

$$\frac{-10 \pm \sqrt{-300}}{50}$$

$$\frac{-10 \pm 10i\sqrt{3}}{50}$$

$$\frac{-1 \pm i\sqrt{3}}{5}$$

$$X = \frac{2}{5}, \frac{-1 \pm i\sqrt{3}}{5}$$

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

$$x^2(3x-2) \mid -3(3x-2) = 0$$

$$(x^2 - 3)(3x-2) = 0$$

$$x^2 = 3$$

$$X = \pm\sqrt{3}, \frac{2}{3}$$

$$10. x^4 - 64 = 0$$

$$(x^2 - 8)(x^2 + 8) = 0$$

$$\sqrt{x^2} = \sqrt{8} \quad \sqrt{x^2} = \sqrt{8}$$

$$x = \pm 2\sqrt{2} \quad x = \pm 2i\sqrt{2}$$

$$X = \pm 2\sqrt{2}, \pm 2i\sqrt{2}$$

$$11. 3x^4 + 3x^3 = 6x^2 + 6x$$

$$3x^4 + 3x^3 \mid -6x^2 - 6x = 0$$

$$3x^3(x+1) \mid -6x(x+1) = 0$$

$$(3x^3 - 6x)(x+1) = 0$$

$$3x(x^2 - 2)(x+1) = 0$$

$$\sqrt{x^2} = \sqrt{2}$$

$$x = \pm\sqrt{2}$$

$$X = 0, -1, \pm\sqrt{2}$$

$$12. 8x^3 + 27 = 0$$

$$(2x+3)(4x^2 - 6x + 9) = 0$$

$$\frac{6 \pm \sqrt{36 - 4(4)(9)}}{8}$$

$$\frac{6 \pm \sqrt{-108}}{8}$$

$$\frac{6 \pm 6i\sqrt{3}}{8}$$

$$\frac{3 \pm 3i\sqrt{3}}{4}$$

$$X = \frac{-3}{2}, \frac{3 \pm 3i\sqrt{3}}{4}$$