

Before we begin, are there any questions from last day's work?

Today's Learning Goal(s):

By the end of the class, I will be able to:

- a) solve polynomial equations by selecting and applying strategies
i.e. factoring, using the quadratic formula
- b) solve problems algebraically that involve polynomial functions & equations
arising from real-world applications

3.5.1 Solving Polynomial Equations

Date: Mar. 29/16

Ex. Solve

1. $x^3 - 3x^2 = 16x - 48$ 2. $2x^3 - 18x = 0$ 3. $x^6 - 25x^4 = 0$

$$x^3 - 3x^2 - 16x + 48 = 0$$

$$x^2(x-3) - 16(x-3) = 0$$

$$(x-3)(x^2 - 16) = 0$$

$$(x-3)(x-4)(x+4) = 0$$

$$\downarrow$$

$$x = 3, 4, -4$$

4. $x^3 = -2x^2 - 4x - 8$

$$x^3 + 2x^2 + 4x + 8 = 0$$

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

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

$$\downarrow$$

$$x = -2 \quad \hookrightarrow x^2 + 4 = 0$$

$$x^2 = -4$$

 \therefore No Real Roots

5. $x^3 - 18 = -2x^2 + 9x$

6. $7x^4 - 4x^3 = 0$

7. $-4x^2 + 36 = -x^3 + 9x$

8. $x^3 + 2x^2 = 2(x^2 + 32)$

$$x^3 + 2x^2 = 2x^2 + 64$$

$$x^3 + 2x^2 - 2x^2 - 64 = 0$$

$$x^3 - 64 = 0$$

$$x^3 = 64$$

$$x = \sqrt[3]{64}$$

$$= 4$$

9. $x(x^2 - x - 2) = 17 - x(x + 2)$

$$x^3 - x^2 - 2x = 17 - x^2 - 2x$$

$$x^3 - x^2 - 2x - 17 + x^2 + 2x = 0$$

$$x^3 - 17 = 0$$

$$x^3 = 17$$

$$x = \sqrt[3]{17}$$

$$\approx 2.5712$$

$$\approx 2.571$$

3.5.2 Applications of Polynomial Equations

Date: _____

1. A box with dimensions $(x + 3)$, $(x - 2)$, and $(5 - x)$ in metres has a volume of 14 m^3 . Determine the dimensions of the box.

$$V = lwh$$

$$14 = (x+3)(x-2)(5-x)$$

$$14 = (x+3)(5x - x^2 - 10 + 2x)$$

$$14 = (x+3)(-x^2 + 7x - 10)$$

$$14 = -x^3 + 7x^2 - 10x - 3x^2 + 21x - 30$$

$$0 = -x^3 + 4x^2 + 11x - 30 - 14$$

$$0 = -x^3 + 4x^2 + 11x - 44$$

$$0 = -(x^3 - 4x^2 - 11x + 44)$$

$$= -(x^2(x-4) - 11(x-4))$$

$$0 = -(x^2 - 11)(x - 4)$$

$$x^2 = 11 \quad \downarrow \quad x = 4$$

$$x = \sqrt{11} \\ = \pm 3.31$$

$$\text{if } x = 4$$

$$x+3 ; x-2 ; 5-x \\ = 7 \quad = 2 \quad = 1$$

$$\text{if } x = -3.31$$

$$x+3 \text{ INADMISSIBLE} \\ = -0.31$$

$$\text{if } x = 3.31$$

2. The area of a rectangle is given by $A = x^2 + 9x + 4$.

If the perimeter of the rectangle is 46 cm, determine the area of the rectangle.

Answers:

- There are two possibilities for the size of the box: 2m by 7m by 1m AND 1.32m by 6.32 m by 1.68m
- 130 cm^2

2. The area of a rectangle is given by $A = 2x^2 + 9x + 4$.

If the perimeter of the rectangle is 46 cm, determine the area of the rectangle.

$$\begin{aligned} A &= 2x^2 + 9x + 4 \\ &= (2x + 1)(x + 4) \\ A &= \overset{\uparrow}{l} \vec{w} \end{aligned} \left\{ \begin{array}{l} P = 46 \\ 2(l + w) = 46 \\ 2l + 2w = 46 \\ 2(2x + 1) + 2(x + 4) = 46 \end{array} \right.$$