

Algebra: Factor, Root & Remainder Theorem (Degree 3)

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DIRECTIONS

Use the Factor and Remainder Theorems with cubic polynomials to find all zeros.

1 Use Remainder Theorem. Find $P(-2)$:

$$P(x) = x^3 + 3x^2 + 3x + 1$$

Answer: _____

2 Find all zeros (Factor Theorem):

$$P(x) = x^3 - x^2 - 4x + 4$$

Answer: _____

3 Find all zeros (Factor Theorem):

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

Answer: _____

4 Use Remainder Theorem. Find $P(3)$:

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

Answer: _____

5 Find all zeros (Factor Theorem):

$$P(x) = x^3 + x^2 - 4x - 4$$

Answer: _____

6 Use Remainder Theorem. Find $P(1)$:

$$P(x) = x^3 + 3x^2 - 4$$

Answer: _____

7 Use Remainder Theorem. Find $P(-1)$:

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

Answer: _____

8 Find all zeros (Factor Theorem):

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

Answer: _____

9 Use Remainder Theorem. Find $P(1)$:

$$P(x) = x^3 + x^2 - 4x - 4$$

Answer: _____

10 Find all zeros (Factor Theorem):

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

Answer: _____

Answer Key & Solutions

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TEACHER NOTES Use Rational Root Theorem to find candidates, verify with synthetic division or direct sub.

1 Use Remainder Theorem. Find $P(-2)$:

$$= P(-2) = -1$$

$$P(x) = x^3 + 3x^2 + 3x + 1$$

2 Find all zeros (Factor Theorem):

$$= x = -2, x = 1, x = 2$$

$$P(x) = x^3 - x^2 - 4x + 4$$

3 Find all zeros (Factor Theorem):

$$= x = -1, x = 1$$

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

4 Use Remainder Theorem. Find $P(3)$:

$$= P(3) = 32$$

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

5 Find all zeros (Factor Theorem):

$$= x = -2, x = -1, x = 2$$

$$P(x) = x^3 + x^2 - 4x - 4$$

6 Use Remainder Theorem. Find $P(1)$:

$$= P(1) = 0$$

$$P(x) = x^3 + 3x^2 - 4$$

7 Use Remainder Theorem. Find $P(-1)$:

$$= P(-1) = 4$$

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

8 Find all zeros (Factor Theorem):

$$= x = -1, x = 1, x = 2$$

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

9 Use Remainder Theorem. Find $P(1)$:

$$= P(1) = -6$$

$$P(x) = x^3 + x^2 - 4x - 4$$

10 Find all zeros (Factor Theorem):

$$= x = -1, x = 1$$

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