

Long Division and Synthetic Division of Polynomials

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1 Long Division

Divide the following polynomials using long division. State the quotient $q(x)$ and remainder $r(x)$.

1.
$$\frac{3x^5 - 4x^4 + x^3 - 2x^2 + x + 1}{x^2 + x - 2}.$$

2.
$$\frac{x^4 - 3x^3 + x^2 - x + 5}{x^3 + x^2 + x + 1}.$$

3.
$$\frac{x^3 + 2x^2 - x - 2}{x^2 - 1}.$$

4.
$$\frac{x^3 - x + 2}{x - 1}.$$

2 Synthetic Division

Divide the following polynomials using synthetic division. State the quotient $q(x)$ and remainder $r(x)$.

1.
$$\frac{x^3 - 2x^2 + x - 4}{x - 7}.$$

2.
$$\frac{x^6 - 4x^5 + 3x^4 - x^3 + x^2 - 2x - 12}{x - 3}.$$

3.
$$\frac{2x^4 + 6x^3 - 5x^2 - 10x + 17}{x - 12}.$$

4.
$$\frac{5x^7 - 6x^5 + x^2 - 13}{x - 9}.$$