

1. Compute and write in standard form.

a. $(x^3 - 3x^2 - 7) - (x^4 - x^2 + 2)$

b. $(x^3 - 3x^2 - 7)(x^4 - x^2 + 2)$

c. Note that this produces a polynomial you can factor by factoring out a common monomial:
 $x^2(x^2 - 5x + 6)$

d. Note that this produces a polynomial you can start to factor using the quadratic form method:
 $(2x^3 + 4)^2$

e. This too: $(x^2 + 4)(x^2 - 1)$

f. Note that this produces polynomial you can start to factor with the grouping method: $(x^3 + 5)(x - 2)$

g. This too: $(2x^2 + 3)(3x - 2)$

2. Divide, writing the remainder as a fraction with the divisor as denominator.

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

3. In the polynomial $ax^2 + bx + c$:

a. What is the degree?

b. What are the terms?

c. What is the leading coefficient (coefficient of the term with the highest degree)?

4. In the polynomial $(3x - 7)(-2x^2 + 4x + 3)$:

a. What is the degree?

b. What is the leading coefficient (coefficient of the term with the highest degree)?

5. For each of the following polynomials, tell the end behavior, the zeros with multiplicities, and the y -intercept. Some of the zeros may be complex. Sketch graphs, dealing only with real zeros:

a. $(x - 2)^2(x + 3)(x - 1)^5(x + 3)(-2x - 1)$

b. $x^4 - 5x^3 + 7x^2 - 5x + 6$ (i is a zero)

6. Factor:

a. $x^4 - 5x^3 + 6x^2$

b. $x^3 - 3x^2 + 4x - 12$

c. $81x^4 - 16$

d. $x^4 - 9x^3 + 28x^2 - 38x + 24$ ($1 + i$ is a factor)

Answers

1.
 - a. $-x^4 + x^3 - 2x^2 - 9$
 - b. $x^7 - 3x^6 - x^5 - 4x^4 + 2x^3 + x^2 - 14$
 - c. Note that this produces a polynomial you can factor by factoring out a common monomial:
 $x^4 - 5x^3 + 6x^2$
 - d. Note that this produces a polynomial you can start to factor using the quadratic form method:
 $4x^6 + 16x^3 + 16$
 - e. This too: $x^4 + 3x^2 - 4$
 - f. Note that this produces polynomial you can start to factor with the grouping method: $x^4 - 2x^3 + 5x - 10$
 - g. This too: $6x^3 - 4x^2 + 9x - 6$
2.
 - a. $2x^2 + 7x + 10 + \frac{11x-21}{x^2-2x+2}$
3. In the polynomial $ax^2 + bx + c$:
 - a. What is the degree? 2
 - b. What are the terms? ax^2 , bx , and c .
 - c. What is the leading coefficient (coefficient of the term with the highest degree)? a
4. In the polynomial $(3x - 7)(-2x^2 + 4x + 3)$:
 - a. What is the degree? 3
 - b. What is the leading coefficient (coefficient of the term with the highest degree)? -6
5.
 - a. End behavior: As $x \rightarrow \infty$, $f(x) \rightarrow -\infty$ (right end goes down); as $x \rightarrow -\infty$, $f(x) \rightarrow -\infty$ (left end goes down). Zeros: -3 (mult 2; note that $x + 3$ appears twice), $-\frac{1}{2}$ (mult. 1), 1 (mult. 5), 2 (mult. 2). y -intercept: 36 .
 - b. Factored: $(x - 2)(x - 3)(x - i)(x + i)$. End behavior: As $x \rightarrow \infty$, $f(x) \rightarrow \infty$; as $x \rightarrow -\infty$, $f(x) \rightarrow \infty$. Zeros: $2, 3, i, -i$. y -intercept: 6
6.
 - a. $x^2(x - 2)(x - 3)$
 - b. $(x - 3)(x - 2i)(x + 2i)$
 - c. $(3x + 2i)(3x - 2i)(3x + 2)(3x - 2)$
 - d. $(x - (1 + i))(x - (1 - i))(x - 3)(x - 4)$