

Algebra II

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0 Preface

I wrote this collection of problems in order to help student's master their ability to solve Algebra II Problems creatively. All problems should be solved without a calculator unless otherwise specified.

1 Polynomial Arithmetic

Problem 1.1

What is the degree of the following polynomials

i) $f(x) = x^2$

ii) $f(x) = 3x^3 + x^2 - 4$

iii) $f(x) = 2 + x + x^4$

iv) $f(x) = \frac{1}{100}x^{100}$

v) $f(x) = \pi$

vi) $f(x) = x(x^2 + x^4) + x^3$

Problem 1.2

Let $f(x) = 3x^2 + 5x^4 - 3x^3 + 4$. Each term of this polynomial has a coefficient and an exponent. What is the sum of all the coefficients?

Problem 1.3

What is the average rate of change of the following polynomials from $t = 1$ to $t = 5$.

i) $f(x) = x^2$

ii) $f(x) = 2x^3 - x$

Problem 1.4

What is the average rate of change of the following polynomials from $t = t_0$ to $t = t_0 + 4$.

i) $f(x) = -2x^2 + 3x + 1$

ii) $f(x) = 1 + x + x^2 + x^3 + x^4 + x^5$

Problem 1.5

Simplify the following expression

$$x(3x^3 + 2x - 9 + 5x^4 - 3^2 + 5x + 1)$$

Problem 1.6

If $f(x) = x(x + 1)$ and $g(x) = 4x^3 + x^2 - x + 1$ simplify the following expression:

$$2f(x) + x^2 \cdot g(x)$$

Problem 1.7

Simplify the following expression

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

Problem 1.8

Simplify the following expressions

i) $(x^2 + 1)(x + 1)$

ii) $(x - 2)(3x^6 + 4x + 1)$

iii) $(x^4 - 2x^3 + x)(3x^3 + 1)$

Problem 1.9

Expand and group like terms for the following expressions:

i) $(x - 1)^2$

ii) $(3x + 2)^2$

iii) $(a + b)^2$

iv) $(a - b)(a + b)$

v) $(a - b)(a + b)(a^2 + b^2)$

Problem 1.10

Expand the following expression

$$(a + b + c)^3$$