

EXERCISES FOR POLY ARITH

Question 1 In Exercises ?? - ??, perform the indicated operations and simplify.

Problem 1.1 $(4 - 3x) + (3x^2 + 2x + 7)$

$$3x^2 - x + 11$$

Problem 1.2 $t^2 + 4t - 2(3 - t)$

$$t^2 + 6t - 6$$

Problem 1.3 $q(200 - 3q) - (5q + 500)$

$$-3q^2 + 195q - 500$$

Problem 1.4 $(3y - 1)(2y + 1)$

$$6y^2 + y - 1$$

Problem 1.5 $\left(3 - \frac{x}{2}\right)(2x + 5)$

$$-x^2 + \frac{7}{2}x + 15$$

Problem 1.6 $-(4t + 3)(t^2 - 2)$

$$-4t^3 - 3t^2 + 8t + 6$$

Problem 1.7 $2w(w^3 - 5)(w^3 + 5)$

$$2w^7 - 50w$$

Problem 1.8 $(5a^2 - 3)(25a^4 + 15a^2 + 9)$

$$125a^6 - 27$$

Problem 1.9 $(x^2 - 2x + 3)(x^2 + 2x + 3)$

$$x^4 + 2x^2 + 9$$

Problem 1.10 $(\sqrt{7} - z)(\sqrt{7} + z)$

$$7 - z^2$$

Problem 1.11 $(x - \sqrt[3]{5})^3$

$$x^3 - 3x^2\sqrt[3]{5} + 3x\sqrt[3]{25} - 5$$

Problem 1.12 $(x - \sqrt[3]{5})(x^2 + x\sqrt[3]{5} + \sqrt[3]{25})$

$$x^3 - 5$$

Problem 1.13 $(w - 3)^2 - (w^2 + 9)$

$$-6w$$

Problem 1.14 $(x + h)^2 - 2(x + h) - (x^2 - 2x)$

$$h^2 + 2xh - 2h$$

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Problem 1.15 $(x - [2 + \sqrt{5}])(x - [2 - \sqrt{5}])$

$$x^2 - 4x - 1$$

Question 2 In these Problems, perform the indicated division. Check your answer by showing

$$\text{dividend} = (\text{divisor})(\text{quotient}) + \text{remainder}$$

Problem 2.1 $(5x^2 - 3x + 1) \div (x + 1)$ quotient: $5x + -8$

remainder: 9

Problem 2.2 $(3y^2 + 6y - 7) \div (y - 3)$ quotient: $3y + 15$

remainder: 38

Problem 2.3 $(6w - 3) \div (2w + 5)$

quotient: 3

remainder: 18

Problem 2.4 $(2x + 1) \div (3x - 4)$ quotient: $\frac{2}{3}$ remainder: $\frac{11}{3}$ **Problem 2.5** $(t^2 - 4) \div (2t + 1)$ quotient: $\frac{t}{2} - \frac{1}{4}$ remainder: $-\frac{15}{4}$ **Problem 2.6** $(w^3 - 8) \div (5w - 10)$ quotient: $\frac{w^2}{5} + \frac{2w}{5} + \frac{4}{5}$

remainder: 0

Problem 2.7 $(2x^2 - x + 1) \div (3x^2 + 1)$ quotient: $\frac{2}{3}$ remainder: $-x + \frac{1}{3}$ **Problem 2.8** $(4y^4 + 3y^2 + 1) \div (2y^2 - y + 1)$ quotient: $2y^2 + y + 1$

remainder: 0

Problem 2.9 $w^4 \div (w^3 - 2)$ quotient: w remainder: $2w$

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Problem 2.10 $(5t^3 - t + 1) \div (t^2 + 4)$ quotient: $5t$ remainder: $-21t + 1$ **Problem 2.11** $(t^3 - 4) \div (t - \sqrt[3]{4})$ quotient:¹ $t^2 + t\sqrt[3]{4} + 2\sqrt[3]{2}$

remainder: 0

Problem 2.12 $(x^2 - 2x - 1) \div (x - [1 - \sqrt{2}])$ quotient: $x - 1 - \sqrt{2}$

remainder: 0

Question 3 In Exercises ?? - ?? verify the given formula by showing the left hand side of the equation simplifies to the right hand side of the equation.**Problem 3.1 Perfect Cube:** $(a + b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$ **Problem 3.2 Difference of Cubes:** $(a - b)(a^2 + ab + b^2) = a^3 - b^3$ **Problem 3.3 Sum of Cubes:** $(a + b)(a^2 - ab + b^2) = a^3 + b^3$ **Problem 3.4 Perfect Quartic:** $(a + b)^4 = a^4 + 4a^3b + 6a^2b^2 + 4ab^3 + b^4$ **Problem 3.5 Difference of Quartics:** $(a - b)(a + b)(a^2 + b^2) = a^4 - b^4$ **Problem 3.6 Sum of Quartics:** $(a^2 + ab\sqrt{2} + b^2)(a^2 - ab\sqrt{2} + b^2) = a^4 + b^4$ **Problem 4** With help from your classmates, determine under what conditions $(a + b)^2 = a^2 + b^2$. What about $(a + b)^3 = a^3 + b^3$? In general, when does $(a + b)^n = a^n + b^n$ for a natural number $n \geq 2$?

¹Note: $\sqrt[3]{16} = 2\sqrt[3]{2}$.