

Show all work neatly and systematically for full credit. Total points: 105(3 points each)

Simplify the expression. Write the result without using negative exponents. (Assume all variables represent nonzero real numbers.)

$$\begin{aligned} 1) & (3m^2n^{-3})^2(m^6n^7) \\ & = 9m^4n^{-6}m^6n^7 \\ & = 9m^{10}n^1 \end{aligned}$$

Perform the indicated calculation. Express your answer using scientific notation.

$$\begin{aligned} 2) & (5.6 \times 10^{-5})(5 \times 10^{-9}) \\ & = 28 \times 10^{-14} \\ & = 2.8 \times 10 \times 10^{-14} \\ & = 2.8 \times 10^{-13} \end{aligned}$$

Evaluate the polynomial.

$$\begin{aligned} 3) & x^2 + 3y^2 + 2xy \text{ for } x = 5 \text{ and } y = -2 \\ & = 5^2 + 3(-2)^2 + 2(5)(-2) \\ & = 25 + 3 \cdot 4 + 10(-2) \\ & = 25 + 12 - 20 \\ & = 17 \end{aligned}$$

Add or subtract.

$$\begin{aligned} 4) & (5x^8 + 4x^7 - 5x^6 - 6) - (3x^8 - 6x^7 + 9x^6 - 2) \\ & = 5x^8 + 4x^7 - 5x^6 - 6 - 3x^8 + 6x^7 - 9x^6 + 2 \\ & = 2x^8 + 10x^7 - 14x^6 - 4 \end{aligned}$$

Multiply.

$$\begin{aligned} 5) & -3y(-9x^3y^6)(-2xy^5) \\ & = 27x^3y^7(-2xy^5) \\ & = -54x^4y^{12} \end{aligned}$$

Divide. Assume all variables are nonzero.

$$\begin{aligned} 6) & \frac{14m^8n - 8m^7n^5 + 10m^6n^7}{2m^5n} \\ & = \frac{14m^8n}{2m^5n} - \frac{8m^7n^5}{2m^5n} + \frac{10m^6n^7}{2m^5n} \\ & = 7m^3 - 4m^2n^4 + 5mn^6 \end{aligned}$$

7) Multiply.

$$\begin{aligned} & (6x - 5)^2 \\ & = (6x - 5)(6x - 5) \\ & = 36x^2 - 30x - 30x + 25 \\ & = 36x^2 - 60x + 25 \end{aligned}$$

Simplify. Do not use negative exponents in your answer.

$$\begin{aligned} 8) & \frac{35x^{-6}yz^2}{5x^2y^4z} \\ & = 7x^{-6-2}y^{1-4}z^{2-1} \\ & = 7x^{-8}y^{-3}z^1 \\ & = \frac{7z}{x^8y^3} \end{aligned}$$

Multiply.

$$9) 4xy^5(-2xy^4 - 12y^3 + 1)$$

$$= -8x^2y^9 - 48xy^8 + 4xy^5$$

$$14) (x^3y + 3)(x^3y - 3)$$

$$= (x^3y)^2 - 3^2$$

$$= x^6y^2 - 9$$

Simplify.

$$10) 5 - 5^{-1} - 5^0$$

$$= 5 - \frac{1}{5} - 1$$

$$= \frac{25}{5} - \frac{1}{5} - \frac{5}{5}$$

$$= \frac{19}{5}$$

Simplify the exponential expression. Write the result using only positive exponents.

$$15) \frac{4^5x^{-3}y^4}{4^8x^{-6}y^8} = 4^{5-8} X^{-3-(-6)} y^{4-8}$$

$$= 4^{-3} X^3 y^{-4}$$

$$= \frac{x^3}{4^3 y^4}$$

$$\text{OR} = \frac{x^3}{64 y^4}$$

Multiply.

$$11) (3x+6)(x+1)$$

$$= 3x^2 + 3x + 6x + 6$$

$$= 3x^2 + 9x + 6$$

Divide using long division.

$$16) \frac{3x^2 + 17x - 36}{x+8} =$$

$$\begin{array}{r} 3x - 7 \\ \hline x+8 \overline{) 3x^2 + 17x - 36} \\ \underline{-(3x^2 + 24x)} \\ -7x - 36 \\ \underline{-(-7x - 56)} \\ 20 \end{array}$$

$$3x - 7 + \frac{20}{x+8}$$

$$12) (x+3)(x^2 - x + 7)$$

$$= x(x^2 - x + 7) + 3(x^2 - x + 7)$$

$$= x^3 - x^2 + 7x + 3x^2 - 3x + 21$$

$$= x^3 + 2x^2 + 4x + 21$$

$$13) (x+10y)(x-4y)$$

$$= x^2 - 4xy + 10xy - 40y^2$$

$$= x^2 + 6xy - 40y^2$$

17) Given a polynomial:

$$4xy^2 - 7x^5y^6z + 4x^3y - 4$$

List the terms:

$$4xy^2, -7x^5y^6z, 4x^3y, -4$$

List the coefficient for each term.

$$4, -7, 4, -4$$

What is the degree of the polynomial?

$$12$$

$$21) 20x^5 + 16x^3 - 4x$$

$$= 4x(5x^4 + 4x - 1)$$

$$= 4x(5x^2 - 1)(x^2 + 1)$$

$$22) xy + 12x - 9y - 108$$

$$= x(y + 12) - 9(y + 12)$$

$$= (y + 12)(x - 9)$$

Multiply.

$$18) \left(12x + \frac{2}{5}\right)\left(12x - \frac{2}{5}\right)$$

$$= (12x)^2 - \left(\frac{2}{5}\right)^2$$

$$= 144x^2 - \frac{4}{25}$$

$$19) (3x + 0.2)(3x - 0.2)$$

$$= (3x)^2 - (0.2)^2$$

$$= 9x^2 - 0.04$$

$$23) x^2 + 9x + 14$$

$$= (x + 7)(x + 2)$$

$$24) 5x^2 + 11x - 12$$

$$= (5x - 4)(x + 3)$$

$$25) 4m - 10mn + 4n$$

$$= 2(2m - 5mn + 2n)$$

Factor the polynomial completely. If the polynomial cannot be factored, say it is prime.

$$20) x^4 - 625$$

$$= (x^2)^2 - 25^2$$

$$= (x^2 + 25)(x^2 - 25)$$

$$= (x^2 + 25)(x + 5)(x - 5)$$

$$26) x^2 - x - 63$$

Prime.

$$\begin{aligned}
 27) & \underline{10x^2 - 15x + 6x - 9} \\
 & = 5x(2x-3) + 3(2x-3) \\
 & = (2x-3)(5x+3)
 \end{aligned}$$

$$\begin{aligned}
 28) & 6x^4y^7z - 10x^3y^6 \\
 & = 2x^3y^6(3xy^7z - 5)
 \end{aligned}$$

$$\begin{aligned}
 33) & 16x^2 + 24xy + 9y^2 \\
 & = (4x+3y)(4x+3y) \\
 & = (4x+3y)^2
 \end{aligned}$$

$$\begin{aligned}
 34) & 4x^2y - 20xy - 56y \\
 & = 4y(x^2 - 5x - 14) \\
 & = 4y(x-7)(x+2)
 \end{aligned}$$

Factor the polynomial completely. If the polynomial cannot be factored, say it is prime.

$$\begin{aligned}
 29) & 63x^3 - 603x^2 + 324x \\
 & = 9x(7x^2 - 67x + 36) \\
 & = 9x(7x-4)(x-9)
 \end{aligned}$$

$$\begin{aligned}
 30) & 10x^2 + 23x + 12 \\
 & = (2x+3)(5x+4)
 \end{aligned}$$

$$\begin{aligned}
 31) & 81x^2 - 4 \\
 & = (9x)^2 - 2^2 \\
 & = (9x+2)(9x-2)
 \end{aligned}$$

$$\begin{aligned}
 32) & 10(x+8) - y(x+8) \\
 & = (x+8)(10-y)
 \end{aligned}$$

Factor completely. If the polynomial is prime, state this.

$$\begin{aligned}
 35) & 45x^3 - 30x^2 - 40x \\
 & = 5x(9x^2 - 6x - 8) \\
 & = 5x(3x-4)(3x+2)
 \end{aligned}$$