

1. (12pts) Simplify and write the answer so all exponents are positive:

$$\begin{aligned} \text{a) } (2x^3y^{-2})^5(6x^{-3}y^{10})^{-2} &= 2^5(x^3)^5(y^{-2})^5 6^{-2}(x^{-3})^{-2}(y^{10})^{-2} \\ &= 32x^{15}y^{-10} \cdot \frac{1}{36} \cdot x^6y^{-20} = \frac{\cancel{32}^9}{\cancel{36}_9} x^{21}y^{-30} = \frac{8x^{21}}{9y^{30}} \end{aligned}$$

$$\begin{aligned} \text{b) } \frac{(4u^4v^{-7})^3}{(12u^{-3}v^4)^2} &= \frac{4^3(u^4)^3(v^{-7})^3}{12^2(u^{-3})^2(v^4)^2} = \frac{\cancel{64}^4 u^{12} v^{-21}}{\cancel{144}_9 u^{-6} v^8} = \frac{4}{9} u^{12+6} v^{-21-8} = \frac{4u^{18}}{9v^{29}} \end{aligned}$$

2. (4pts) Convert to scientific notation or a decimal number:

$$5.7034 \times 10^{-4} = 0.00057034$$

$$1,034,000,000 = 1.034 \times 10^9$$

3. (8pts) Simplify and write in standard form:

$$\begin{aligned} \text{a) } 3x(x^2 - 3) - (4x - 5)(x + 3) &= 3x^3 - 9x - (4x^2 + 12x - 5x - 15) \\ &= 3x^3 - 9x - 4x^2 - 7x + 15 \\ &= 3x^3 - 4x^2 - 16x + 15 \end{aligned}$$

$$\begin{aligned} \text{b) } (2x - 1)(3x^2 - x - 5) &= 6x^3 - 2x^2 - 10x - 3x^2 + x + 5 \\ &= 6x^3 - 5x^2 - 9x + 5 \end{aligned}$$

4. (15pts) Use formulas to expand:

a) $(3x + 4)(3x - 4) = (3x)^2 - 4^2 = 9x^2 - 16$

b) $(5x + 2y)^2 = (5x)^2 + 2 \cdot 5x \cdot 2y + (2y)^2$
 $= 25x^2 + 20xy + 4y^2$

c) $(3x - 10)^3 = (3x)^3 - 3 \cdot (3x)^2 \cdot 10 + 3 \cdot (3x) \cdot 10^2 - 10^3$
 $= 27x^3 - 270x^2 + 900x - 1000$

5. (15pts) Factor the following. Use either a known formula or a factoring method.

a) $x^2 - 4x - 32 = (x - 8)(x + 4)$

prod = -32 -8, 4
sum = -4

b) $9x^2 + 3x - 2 = 9x^2 + 6x - 3x - 2 = 3x(3x + 2) - (3x + 2)$

prod = -18 6, -3
sum = 3
 $= (3x - 1)(3x + 2)$

c) $8u^3 + 27 = (2u)^3 + 3^3$
 $= (2u + 3)((2u)^2 - 2u \cdot 3 + 3^2)$
 $= (2u + 3)(4u^2 - 6u + 9)$

6. (6pts) Fill in the appropriate prefix:

The bomb has the same destructive power as 4×10^6 tons of TNT, or 4 mega tons.

The wavelength of blue light is about 400×10^{-9} meters, or 400 nano meters.

The hard drive has a capacity of 20×10^{12} bytes, or 20 tera bytes.