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Tutoring Sheet Basics #1 – Solution

1. Simplify each of the following. Leave answers with exponents:

a. $3^8 \times 3^3 = 3^{11}$ b. $(-3)^5 \times 3^4 = -3^5 \times 3^4 = -3^9$

c. $(2x)^5 \times (2x)^6 = 2^5x^5 \times 2^6x^6 = 2^{11}x^{11}$

d. $(2xy^2z^3)^4 = 2^4x^4y^8z^{12}$ e. $\dfrac{-12x^3y^2z^5}{6x^2y^2z^6} = -2xz^{-1}$

f. $3\sqrt{y} \times 5\sqrt{y} = 15y$ g. $\sqrt[3]{x^2y^3} = x^{2/3}y$

h. $\dfrac{5}{\sqrt{5}} = 5 \times 5^{-1/2} = 5^{1/2}$ i. $\left(\dfrac{ab^2}{a+b}\right)^0 = 1$ j. $\dfrac{x^4 \times x^{-3}}{\left(x^{-2}\right)^{-3}} = \dfrac{x}{x^6} = x^{-5}$

2. Add or subtract as indicated :

a. $3x^2 + 2x^2 - 5x + 4x^3 + x^2 - 8x = 4x^3 + 6x^2 - 13x$

b. $3y^3 + 9y^2 - 11y + 8 + 4y^2 - 10y + 6 = 3y^3 + 13y^2 - 21y + 14$

c. $6x - x^2 + 16y - 2y^2 - 0.5x^2 - 0.5y^2 - xy = -1.5x^2 - 2.5y^2 + 6x + 16y - xy$

3. Perform each of the following operations:

a. $x(13-2x-y) + y(13- x -2y) = -2x^2 + 13x - 2y^2 - 2xy + 13y$

b. $(3x+5)(4x^2 - 2x - 1) = 12x^3 + 14x^2 - 13x - 5$

c. $(3x - 1)^2 = 9x^2 - 6x + 1$

d. $(x-2)(2x+3)^2 = (x-2)(4x^2 + 12x + 9) = 4x^3 + 4x^2 - 15x - 18$

e. $x(x - 4)^3 = x(x^3 - 12x^2 + 48x - 64) = x^4 - 12x^3 + 48x^2 - 64x$

f. $(2p - 5q)(2p + 5q) = (2p)^2 - (5q)^2 = 4p^2 - 25q^2$

4. Factor as completely as possible :

a. $2xy^2 - 4xy + 5x = x(2y^2 - 4y + 5)$

b. $x^2 - 6x + 5 = (x-1)(x-5)$

c. $3x^4 + 13x^3 + 4x^2 = x^2(3x^2 + 13x + 4) = x^2(3x+1)(x+4)$

d. $10x^2 - 11x + 3 = (5x-3)(2x-1)$

e. $4x^2 - 20x + 25 = (2x-5)(2x-5) = (2x-5)^2$

f. $81p^2 - 25q^2 = (9p-5q)(9p+5q)$; using a^2-b^2

g. $8p^3 - 1 = (2p)^3 - 1 = (2p-1)(4p^2 - 2p + 1)$; using a^3-b^3

h. $125p^3 + 216 = (5p)^3 + 6^3 = (5p+6)(25p^2 - 60p + 36)$; using $a^3 + b^3$

5. Perform each operation :

a. $\frac{4x}{5} \times \frac{35x}{12} = \frac{7x^2}{3}$

b. $\frac{5x^2}{24} - \frac{75x}{36} = \frac{15x^2 - 150x}{72}$

c. $\frac{6}{15x} + \frac{2}{3x} - \frac{9}{10x} = \frac{12 + 20 - 27}{30x} = \frac{5}{30x} = \frac{1}{6x}$

d. $\frac{x^2 - 3x + 2}{2x(x-1)} \div \frac{x-2}{8x} = \frac{(x-1)(x-2)}{2x(x-1)} \times \frac{8x}{x-2}$ = 8/2 = 4

e.
$$\frac{2x-10}{5x} - \frac{20x-25}{12} = \frac{24x - 120 - 100x^2 + 125x}{60x} = \frac{-100x^2 + 149x - 120}{60x}$$

f. $\frac{5}{x-2} - \frac{4}{x} = \frac{5x - 4(x-2)}{x(x-2)} = \frac{5x - 4x + 8}{x(x-2)} = \frac{x+8}{x(x-2)}$

6. Simplify :

i. $\sqrt[3]{54p^3q^5} = \sqrt[3]{2 \times 27 p^3 q^3 q^2} = 3pq\sqrt[3]{2q^2}$

ii. $3^{-2} + 3^{-1} = 1/3^2 + 1/3 = 1/9 + 1/3 = 1/9 + 3/9 = 4/9$

iii. $\sqrt[5]{-32} = \sqrt[5]{(-2)^5} = -2$

iv. $\frac{\sqrt{2}}{1+\sqrt{3}} \times \frac{1-\sqrt{3}}{1+\sqrt{3}} = \frac{2(1-\sqrt{3})}{1-3} = \sqrt{3} - 1$

v. $\left(\left(2\sqrt{5} - \sqrt{3}\right)\left(\sqrt{5} + 2\sqrt{3}\right)\right) = 2(5) + 4\sqrt{15} - \sqrt{15} - 2(6) = -2 + 3\sqrt{15}$

vi. $p^{\frac{2}{3}}\left(2p^{\frac{1}{3}} + 5p\right) = 2p^{\frac{2}{3}+\frac{1}{3}} + 5p^{\frac{2}{3}+1} = 2p + 5p^{5/3}$