MATH 6 HOMEWORK 19

March 8, 2026

1. **Exponents Laws**

$$a^0 = 1$$

$$a^m \times a^n = a^{m+n}$$

$$a^m \div a^n = a^{m-n}$$

$$(ab)^n = a^n b^n$$

$$\left(\frac{a}{b}\right)^n = \frac{a^n}{b^n}$$

$$a^{-n} = \frac{1}{a^n}$$

$$(a^m)^n = a^{mn}$$

2. **Radicals**

$$a^{\frac{1}{2}} = \sqrt{a}$$

$$a^{\frac{m}{n}} = \sqrt[m]{a^n}$$

$$\sqrt{ab} = \sqrt{a}\sqrt{b} \qquad \color{red}{\sqrt{a+b} \neq \sqrt{a} + \sqrt{b}}$$

3. **Main Algebraic Identities**

$$(a+b)^2 = a^2 + 2ab + b^2$$

$$(a-b)^2 = a^2 - 2ab + b^2$$

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

4. **And factorizing**

$$a(b+c) = ab + ac$$

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1. Without a calculator, compute:

$$19999 \cdot 20001$$

   [Use algebraic identity $(a^2 - b^2)$]

2. Radicals

   a. $\sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} = 7^{\overset{?}{?}} = 7^? \cdot \sqrt{7}$

   b. $\sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} = 3^? \cdot \sqrt[3]{3^?}$

   c. $\sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} \cdot \sqrt[3]{3} =$

   d. $(\sqrt{17} - \sqrt{11}) \cdot (\sqrt{17} + \sqrt{11}) =$

   e. $(\sqrt{7} - \sqrt{2}) \cdot (\sqrt{7} + \sqrt{2}) =$

   f. $(\sqrt{11} - \sqrt{3}) \cdot (\sqrt{11} + \sqrt{3}) =$

3. Simplify:

   (a) $\left(\dfrac{15a^2b^5}{5a^4b^3}\right)^3 =$

   (b) $\dfrac{(-ab)^{117}}{(ab)^{103}} =$

   (c) $\left(\dfrac{7a^5b^{12}}{21a^3b^{13}}\right)^2 =$

   (d) $\left(\dfrac{15a^2b^5}{5a^4b^3}\right)^{-3} =$

   (e) $\dfrac{(-ab)^7}{(-ab)^3} =$

   (f) $\left(\dfrac{7a^5b^{12}}{21a^3b^{13}}\right)^{-2} =$

4. Factorize as much as possible (i.e., write as a product) the following expressions:

   a. $ac + ab$

   b. $x^2 - 4x^4$

   c. $x^2 - 2x - yx + 2y$

   d. $4x^2 - 4x + 1$

   e. $4x^2 + 16x + 2xy + 8y$

   f. $x^2(x + 4) - 5(x + 4)$

   g. $100x^8y^2 - 16x^4y^6$

   h. $a^2 + 2ab + b^2$

   i. $a^2 - 2a + 1$

   j. $x^2 - 7 \quad Hint: 7 = \left(\sqrt{7}\right)^2$

   k. $a^4 - b^4 \quad Hint: a^4 = (a^2)^2$