MATH 6 HOMEWORK 20

April 7, 2024

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**

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

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

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

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. $\sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} \cdot \sqrt{7} = 7^{\frac{?}{?}} = 7^{?} \cdot \sqrt{7}$
   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. $(\sqrt{11} - \sqrt{3}) \cdot (\sqrt{11} + \sqrt{3}) =$

1. Simplify:

(a) $\left(\frac{15a^2b^5}{5a^4b^3}\right)^3 =$ (b) $\frac{(-ab)^{117}}{(ab)^{103}} =$ (c) $\left(\frac{7a^5b^{12}}{21a^3b^{13}}\right)^2 =$

(d) $\left(\frac{15a^2b^5}{5a^4b^3}\right)^{-3} =$ (e) $\frac{(-ab)^7}{(-ab)^3} =$ (f) $\left(\frac{7a^5b^{12}}{21a^3b^{13}}\right)^{-2} =$

3. 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. $a^4 - b^4 Hint: a^4 = (a^2)^2$