Math 1271-70 (Calculus 1). Fall 2014.

Algebra Worksheet

Possibly helpful formulas

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

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

$$(a+b)^3 = a^3 + 3a^2b + 3ab^2 + b^3$$

$$a^3 + b^3 = (a+b)(a^2 - ab + b^2)$$

$$a^3 - b^3 = (a-b)(a^2 + ab + b^2)$$

Level descriptions

Level 1: fairly routine; everyone in the class should be able to do.

Level 3: fairly difficult; far from everyone will be able to do.

Level 2: something inbetween.

Problem 1. Write the following as a single fraction.

1. $\dfrac{1}{x} + \dfrac{1}{y} + \dfrac{1}{z}$ (level 1).
2. $\dfrac{\frac{1}{x} + \frac{1}{y}}{\frac{1}{u} + \frac{1}{v}}$ (level 1).
3. $5 + \dfrac{t+1}{t^2 + 7t + 10} + \dfrac{t+3}{t^2 + 9t + 14}$ (level 1).

Problem 2. Simplify

1. $\dfrac{2}{x-3} - \dfrac{1}{x-1} - \dfrac{x+1}{x^2 - 4x + 3}$ (level 1).
2. $\dfrac{1}{b(abc + a + c)} - \dfrac{\dfrac{1}{a + \dfrac{1}{b + \dfrac{1}{c}}}}{\dfrac{1}{a + \dfrac{1}{b}}}$ (level 1).
3. $x^{-3/2}\sqrt{x^{-1}y}(yz^5)^{-1}\sqrt[10]{x^{20}y^5z^{50}}$ (level 1).
4. $t \cdot \dfrac{1 + \dfrac{2}{\sqrt{t+4}}}{2 - \sqrt{t+4}} + \sqrt{t+4} + \dfrac{4}{\sqrt{t+4}}$ (level 1+).
5. $\left(\left(\dfrac{2^{3/2} + 27y^{3/5}}{\sqrt{2} + 3\sqrt[5]{y}} + 3\sqrt[10]{32y^2} - 2\right) \cdot 3^{-2}\right)^5$ (level 2-).
6. $\dfrac{2x^{-1/3}}{x^{2/3} - 3x^{-1/3}} - \dfrac{x^{2/3}}{x^{5/3} - x^{2/3}} - \dfrac{x+1}{x^2 - 4x + 3}$ (level 2).

7. $\dfrac{\dfrac{x-1}{x+x^{1/2}+1}}{\dfrac{x^{1/2}+1}{x^{3/2}-1}}$ (level 2).

8. $\dfrac{\dfrac{\sqrt{x}+1}{x\sqrt{x}+x+\sqrt{x}}}{\dfrac{1}{x^2-\sqrt{x}}}$ (level 3).

Problem 3. Write the following as a fraction with integer denominator ("rationalize the denominator")

1. $\dfrac{5}{3+4\sqrt{2}}$ (level 1).

2. $\dfrac{5}{3\sqrt{3}+4\sqrt{2}}$ (level 1).

3. $\dfrac{4}{\sqrt[4]{13}-\sqrt[4]{9}}$ (level 2).

4. $\dfrac{14}{\sqrt[4]{3}+\sqrt[8]{2}}$ (level 2).

5. $\dfrac{3+\sqrt{2}+\sqrt{3}}{3-\sqrt{2}-\sqrt{3}}$ (level 2).