

Use formulas to expand:

1. (4pts) $(5a - b^2)(5a + b^2) = (5a)^2 - (b^2)^2 = 25a^2 - b^4$

2. (4pts) $(3x + y)^2 = (3x)^2 + 2 \cdot 3x \cdot y + y^2 = 9x^2 + 6xy + y^2$

3. (5pts) $(u^3 - 4v^3)^2 = (u^3)^2 - 2 \cdot u^3 \cdot 4v^3 + (4v^3)^2 = u^6 - 8u^3v^3 + 16v^6$

4. (8pts) Compute expressions with fractions by hand.

$\frac{3 \cdot 9 \cdot \cancel{16}^4}{\cancel{20}_5 \cdot \cancel{15}_5} = \frac{12}{25}$

$\frac{21}{10} \div \frac{49}{6} = \frac{\cancel{21}^3}{\cancel{10}_5} \cdot \frac{\cancel{6}_3}{\cancel{49}_7} = \frac{9}{35}$

$\frac{3 \cdot 3}{3 \cdot 5} - \frac{4}{15} = \frac{9-4}{15} = \frac{5}{15} = \frac{1}{3}$

$\frac{5 \cdot 11}{5 \cdot 12} - \frac{21 \cdot 3}{20 \cdot 3} = \frac{55-63}{60} = -\frac{8}{60} = -\frac{2}{15}$

$\left. \begin{array}{l} 12 = 2 \cdot 2 \cdot 3 \\ 20 = 2 \cdot 2 \cdot 5 \end{array} \right\} \text{LCD} = 2 \cdot 2 \cdot 3 \cdot 5 = 60$

Multiply or divide the rational expressions.

5. (7pts) $\frac{\frac{5(x+4)}{5x+20} \cdot \frac{(x+7)(x-3)}{x^2+4x-21}}{\frac{(x+7)(x-2)}{10(x+4)}} = \frac{\cancel{5}(x+4) \cdot \cancel{(x+7)}(x-3)}{\cancel{(x+7)}(x-2) \cdot \cancel{10}(x+4)} = \frac{x-3}{2(x-2)}$

$$6. (7\text{pts}) \frac{3x-12}{3x^2+2x-5} \div \frac{(x-4)(x+1)}{3x-3} = \frac{3(\cancel{x-4})}{(\cancel{x-4})(3x+5)} \cdot \frac{3(\cancel{x-1})}{(\cancel{x-4})(x+1)} = \frac{9}{(3x+5)(x+1)}$$

$$\text{prod} = -15 \quad -5, -3$$

$$\text{sum} = 2$$

$$3x^2 + 5x - 3x - 5$$

$$x(3x+5) - (3x+5)$$

$$(x-1)(3x+5)$$

Add or subtract the rational expressions.

$$7. (6\text{pts}) \frac{4x^2+7}{x^2-5x-24} - \frac{3x+2}{x-8} = \frac{4x^2+7}{(x-8)(x+3)} - \frac{(3x+2)(x+3)}{(x-8)(x+3)} = \frac{4x^2+7-(3x+2)(x+3)}{(x-8)(x+3)}$$

$$= \frac{4x^2+7-(3x^2+9x+2x+6)}{(x-8)(x+3)} = \frac{4x^2+7-3x^2-11x-6}{(x-8)(x+3)} = \frac{x^2-11x-1}{(x-8)(x+3)} \leftarrow \text{doesn't factor}$$

$$8. (8\text{pts}) \frac{6x-6}{2x^2-x-10} + \frac{-3x+2}{x^2-4} = \frac{6x-6}{(x+2)(2x-5)} + \frac{-3x+2}{(x-2)(x+2)}$$

$$\text{prod} = -20 \quad -5, 4$$

$$\text{sum} = -1$$

$$2x^2 - 5x + 4x - 10$$

$$= x(2x-5) + 2(2x-5)$$

$$= (x+2)(2x-5)$$

$$= \frac{(6x-6)(x-2) + (-3x+2)(2x-5)}{(x+2)(2x-5)(x-2)}$$

$$= \frac{6x^2 - 12x - 6x + 12 - 6x^2 + 15x + 4x - 10}{(x+2)(2x-5)(x-2)}$$

$$= \frac{-x+2}{(x+2)(2x-5)(x-2)}$$

$$= \frac{1}{(2x-5)(x-2)}$$

Simplify the following expressions, assuming all variables are positive.

$$9. (3\text{pts}) \sqrt{54x^3y^8} = \sqrt{9 \cdot 6 \cdot x^2 \cdot x \cdot y^2 \cdot y^2 \cdot y^2 \cdot y^2} = 3x \cdot y \cdot y \cdot y \cdot y \sqrt{6x} = 3xy^4 \sqrt{6x}$$

$$10. (4\text{pts}) \sqrt[3]{20a^4b^5} \sqrt[3]{2a^2b^5} = \sqrt[3]{40a^6b^{10}} = \sqrt[3]{8 \cdot 5 \cdot a^3 \cdot a^3 \cdot b^3 \cdot b^3 \cdot b^4} = 2a \cdot a \cdot b \cdot b \cdot b \sqrt[3]{5b} = 2a^2b^3 \sqrt[3]{5b}$$

$$11. (4\text{pts}) (7 + \sqrt{5})(3 - \sqrt{20}) = (7 + \sqrt{5})(3 - 2\sqrt{5})$$

$$= 21 - 14\sqrt{5} + 3\sqrt{5} - 2\sqrt{5}^2$$

$$= 21 - 11\sqrt{5} + 2 \cdot 5 = 11 - 11\sqrt{5}$$