

Unit Test Three (First Attempt)

REMINDER: Write restriction on all answers where they exist. Failure to do so will result in a point of each question (up to a max of 15%). Stating restrictions that don't exist will have a similar penalty.

1. What is a rational expression?

A rational expression is a fraction of polynomials.

2. Explain why, in this rational expression, the variable is not allowed to take the value 2:

$$\frac{x+2}{x-2}$$

If x were allowed to be two, then this expression would represent a division by zero, which is not defined in our number system.

3. Divide the polynomial $x^3 + 3x^2 + 2x - 5$ by $(x+5)$. Write your answer in the form $P = DQ + R$.

$$\begin{array}{r} x^2 - 2x + 12 \\ x+5 \overline{) x^3 + 3x^2 + 2x - 5} \\ \underline{x^3 + 5x^2} \\ -2x^2 + 2x - 5 \\ \underline{-2x^2 - 10x} \\ 12x - 5 \\ \underline{12x + 60} \\ -65 \end{array}$$

$$\begin{array}{l} x^3 + 3x^2 + 2x - 5 = (x+5)(x^2 - 2x + 12) - 65 \\ x \neq -5 \end{array}$$

4. Factor the trinomial $x^2 + 5x - 6$.

$$(x+6)(x-1)$$

5. Explain why $(x+4)^2$ is not equal to $x^2 + 16$.

Squaring a binomial means it must be multiplied by itself and therefore one must use the distributive property of multiplication:

$$(x+4)(x+4) = x^2 + 8x + 16$$

6. Simplify: $\frac{3x+2}{x+2} \times \frac{2x+4}{x+1} = \frac{(3x+2)(2)(\cancel{x+2})}{(\cancel{x+2})(x+1)}$

$$= \frac{6x+4}{x+1}, x \neq -2, -1$$

7. Simplify: $\frac{x^2+5x+6}{x^2+7x+10} \times \frac{2x^2-7x-4}{x^2-x-12} = \frac{\cancel{(x+3)} \cancel{(x+2)} (2x+1) \cancel{(x-4)}}{(x+5) \cancel{(x+2)} \cancel{(x-4)} \cancel{(x+3)}}$

$$= \frac{2x+1}{x+5}, x \neq -5, -3, -2, 4$$

8. Simplify: $\frac{x+2}{x-3} \div \frac{x^2+8x+12}{2x-6} = \frac{\cancel{x+2}}{\cancel{x-3}} \times \frac{2 \cancel{(x-3)}}{(x+6) \cancel{(x+2)}}$

$$= \frac{2}{x+6}, x \neq -6, -2, 3$$

9. Add / Subtract:

a) $\frac{3}{x} + \frac{2y}{x^2} - \frac{5}{xy} = \frac{3xy}{x^2y} + \frac{2y^2}{x^2y} - \frac{5x}{x^2y}$

$$= \frac{2y^2 + 3xy - 5}{x^2y}, x \neq 0, y \neq 0$$

b) $\frac{2}{x+1} - \frac{x+3}{2x+2} = \frac{2}{x+1} - \frac{x+3}{2(x+1)}$

$$= \frac{2 \cdot 2 - (x+3)}{2(x+1)}$$

$$= \frac{1-x}{2x+2}, x \neq -1$$

c) $\frac{x}{x^2-9x+18} - \frac{x-2}{x^2-10x+24} = \frac{x}{(x-6)(x-3)} - \frac{x-2}{(x-6)(x-4)}$

$$= \frac{x(x-4) - (x-2)(x-3)}{(x-6)(x-3)(x-4)}$$

$$= \frac{x^2 - 4x - x^2 + 6x - 6}{(x-6)(x-3)(x-4)}$$

$$= \frac{2x-6}{(x-6)(x-3)(x-4)}$$

$$= \frac{2}{(x-6)(x-4)}, x \neq 3, 4, 6$$