

1. 6.2 Add the rational expressions. Express your final answer in lowest terms.

$$\frac{x-1}{x^2-4x-5} + \frac{2x-3}{x^2+3x+2} = \frac{x-1}{(x-5)(x+1)} \cdot \frac{x+2}{x+2} + \frac{2x-3}{(x+2)(x+1)} \cdot \frac{x-5}{x-5}$$

$$= \frac{(x-1)(x+2) + (2x-3)(x-5)}{\text{LCD}} = \frac{x^2+x-2+2x^2-13x+15}{\text{LCD}}$$

$$= \frac{3x^2 - 12x + 13}{(x-5)(x+1)(x+2)}$$

$$\text{LCD} = (x-5)(x+1)(x+2)$$

2. 6.3 Simplify the complex fraction.

$$\text{a. } \frac{\frac{2}{x+2} + \frac{6}{x+7}}{\frac{4x+13}{x^2+9x+14}} = \frac{\frac{2}{x+2} \cdot \frac{x+7}{x+7} + \frac{6}{x+7} \cdot \frac{x+2}{x+2}}{\frac{4x+13}{(x+7)(x+2)}}$$

$$\frac{\frac{2x+14+6x+12}{(x+7)(x+2)}}{\frac{4x+13}{(x+7)(x+2)}} = \frac{8x+26}{(x+7)(x+2)} \cdot \frac{(x+7)(x+2)}{4x+13}$$

$$= \frac{8x+26}{4x+13} = \frac{2(4x+13)}{4x+13} = \boxed{2}$$

$$\text{b. } \frac{5x^{-2} - 3y^{-1}}{x^{-1} + y^{-1}} = \frac{\frac{5}{x^2} - \frac{3}{y}}{\frac{1}{x} + \frac{1}{y}} = \frac{\frac{5y - 3x^2}{x^2y}}{\frac{y+x}{xy}} = \frac{5y - 3x^2}{x^2y} \cdot \frac{xy}{x+y}$$

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

3. 6.4 Divide.  $(2x^5 - 6x^4 + x^3 - 4x + 3) \div (x^2 - 3)$ . Express your final answer in the form  
Dividend = Divisor • Quotient + Remainder

$$\begin{array}{r}
 2x^3 - 6x^2 + 7x + 18 \quad r \quad 17x - 51 \\
 x^2 - 3 \overline{) 2x^5 - 6x^4 + x^3 + 0x^2 - 4x + 3} \\
 \underline{-(2x^5 - 6x^3)} \phantom{+ 3} \\
 -6x^4 + 7x^3 + 0x^2 - 4x + 3 \\
 \underline{-(-6x^4 - 18x^2)} \\
 7x^3 + 18x^2 - 4x + 3 \\
 \underline{-(7x^3 - 21x)} \\
 18x^2 + 17x + 3 \\
 \underline{-(18x^2 + 54)} \\
 17x - 51
 \end{array}$$

$$2x^5 - 6x^4 + x^3 - 4x + 3 = (x^2 - 3)(2x^3 - 6x^2 + 7x + 18) + 17x - 51$$

4. 6.4 Use synthetic division to divide.  $\frac{5x^5 - 24x^4 + 14x^3 + 11x^2 + 7}{x - 4}$  Express your final result in  
the form Dividend = Divisor • Quotient + Remainder.

$$\begin{array}{r|rrrrrr}
 4 & 5 & -24 & 14 & 11 & 0 & 7 \\
 & & 20 & -16 & -8 & 12 & 48 \\
 \hline
 & 5 & -4 & -2 & 3 & 12 & 55
 \end{array}$$

$$5x^5 - 24x^4 + 14x^3 + 11x^2 + 7 = (x - 4)(5x^4 - 4x^3 - 2x^2 + 3x + 12) + 55$$

5. 6.4 Bonus If  $f(x) = 5x^5 - 24x^4 + 14x^3 + 11x^2 + 7$ , what is  $f(4)$ ? Full credit only if you use your previous work.

$$f(4) = 55$$