

Name: \_\_\_\_\_

Date: \_\_\_\_\_

**HW Pre-Calculus 11 Section 6.2 Multiplying and Dividing Rational Expressions**

1. Multiply or Divide each of the following rational :

|                                                                                        |                                                                                                             |                                                                                                                           |
|----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------|
| a) $\frac{8x}{9} \times \frac{27y}{24x^3}$<br>$= \frac{3}{3x^2} = \frac{1}{x^2}$       | b) $\frac{14a^2}{2b} \times \frac{8b^3}{21a} = \frac{(2a)(4b^2)}{3}$<br>$= \frac{8ab^2}{3}$                 | c) $\frac{14x^2y}{6xy} \times \frac{(4xy)^2}{8xy}$<br>$= \frac{14x^2y}{3} \times \frac{16x^2y^2}{8xy} = \frac{14x^2y}{3}$ |
| d) $\frac{-6x}{14} \div \frac{12x^2}{35x}$<br>$= -\frac{5}{4}$                         | e) $\frac{-15xy}{9y^3} \div \frac{9x^2}{-16xy}$<br>$= \frac{80}{27y}$                                       | f) $\frac{2x+1}{15y^2} \div \frac{12xy}{27y^3} \div \frac{8x+4}{9xy}$<br>$= \frac{27y}{80}$                               |
| g) $\frac{8x-4}{x-3} \times \frac{2x+6}{3x-6}$<br>$= \frac{8(2x-1)(x+3)}{3(x-3)(x-2)}$ | h) $\frac{5x^2-10}{3x-y} \times \frac{27x-9y}{4x^2-8}$<br>$= \frac{5}{1} \times \frac{9}{4} = \frac{45}{4}$ | i) $\frac{3x+6}{3x-4} \times \frac{6x^2-8x}{4x+8}$<br>$= \frac{3x}{2}$                                                    |

2. Factor and simplify. Then state all the NPV's:

|                                                                                                                                                                                                                                                |                                                                                                                                                                         |                                                                                                                                                                                       |
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| a) $\frac{(2x)^2}{5y} \times \frac{10x}{8y} \div \frac{15x}{(4y)^2}$<br>$= \frac{4x^2}{5y} \times \frac{10x}{8y} \times \frac{16y^2}{15x}$<br>$= \frac{4x^2}{5} \times 2 \times \frac{2}{3} = \frac{16x^2}{15}$<br>NPV's: $y \neq 0, x \neq 0$ | b) $\frac{3(3x-4)}{8} \times \frac{6x}{12(3x-4)}$<br>$= \frac{3}{8} \times \frac{x}{2} = \frac{3x}{16}$<br>NPV's: $x \neq \frac{4}{3}$                                  | c) $\frac{2x-3}{x+2} \div \frac{3x+4}{x^2-9}$<br>$= \frac{2x-3}{x+2} \times \frac{(x+3)(x-3)}{3x+4}$<br>$= \frac{2x-3(x+3)(x-3)}{(x+2)(3x+4)}$<br>NPV's: $x \neq -2, 3, -\frac{4}{3}$ |
| d) $\frac{15x}{2x+6} \div \frac{10x}{3x+9}$<br>$= \frac{3}{2} \times \frac{3}{2} = \frac{9}{4}$<br>NPV's: $x \neq -3, 0$                                                                                                                       | e) $\frac{(x+1)(x-1)}{(2x+1)} \times \frac{8x+4}{x^2+2x+1}$<br>$= \frac{(x-1)}{1} \times \frac{4}{(x+1)}$<br>$= \frac{4(x-1)}{x+1}$<br>NPV's: $x \neq -1, -\frac{1}{2}$ | f) $\frac{8x^3-2x}{5x(x^4-13x^2+36)}$<br>$= \frac{2x(4x^2-1)}{5x(x^2-9)(x^2-4)}$<br>$= \frac{2x(2x-1)(2x+1)}{5x(x-3)(x+3)(x-2)(x+2)}$<br>NPV's: $x \neq 0, 2, -2, 3, -3$              |

|                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                           |
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| <p>g) <math>\frac{x+14}{x^2-16} \div \frac{x^2-5x-14}{x^2-2x-8}</math></p> $\frac{\cancel{x+14}}{(\cancel{x-4})(x+4)} \times \frac{(\cancel{x-4})(x+2)}{(x-7)(\cancel{x+2})}$ $= \frac{x+14}{(x+4)(x-7)}$ <p>NPV's: <math>x \neq 4, -4, 7, -2</math></p>                                                                              | <p>h) <math>\frac{(x+1)^2}{x^2-1} \times \frac{x^2-4}{x^2+3x+2}</math></p> $\frac{(\cancel{x+1})(\cancel{x+1})}{(\cancel{x-1})(\cancel{x+1})} \times \frac{(x-2)(\cancel{x+2})}{(\cancel{x+2})(\cancel{x+1})}$ $= \frac{x-2}{x-1}$ <p>NPV's: <math>x \neq -1, 1, -2</math></p>                            | <p>i) <math>\frac{x^2+5x+6}{x^2-5x+6} \div \frac{x^2-x-6}{x^2+x-6}</math></p> $\frac{(\cancel{x+2})(x+3)}{(x-3)(\cancel{x+2})} \times \frac{(x-3)(\cancel{x+2})}{(x-3)(\cancel{x+2})}$ $= \frac{(x+3)(x+3)}{(x-3)(x-3)}$ <p>NPV's: <math>x \neq 2, -2, -3, 3</math></p>                                                                                                                                   |
| <p>j) <math>\frac{x^2-16y^2}{6x^2y} \div \frac{x^2+xy-20y^2}{4x^3y^2}</math></p> $\frac{(\cancel{x-4y})(\cancel{x+4y})}{3\cancel{6x^2}y} \times \frac{4\cancel{x^3}y^2y}{(x+5y)(\cancel{x+4y})}$ $= \frac{(\cancel{x+4y})}{3} \times \frac{2xy}{(x+5y)}$ $= \frac{(x+4y)(2xy)}{3(x+5y)}$ <p>NPV's: <math>x \neq -5y, 4y, 0</math></p> | <p>k) <math>\frac{x^2+4x-5}{3x-6} \times \frac{x-2}{1-x}</math></p> $\frac{(\cancel{x+5})(\cancel{x-1})}{3(\cancel{x-2})} \times \frac{x-2}{-(\cancel{x-1})}$ $= \frac{(\cancel{x+5})}{3} \times (-1)$ $= -\frac{(x+5)}{3}$ <p>NPV's: <math>x \neq 2, 1</math></p>                                        | <p>l) <math>\frac{m^2-9mn+14n^2}{m^2+7mn+12n^2} \div \frac{3m^2-21mn}{4m^3+16m^2n}</math></p> $\frac{(m-2n)(\cancel{m-7n})}{(m+3n)(\cancel{m+4n})} \times \frac{4m^2(\cancel{m+4n})}{3\cancel{m}(m-7n)}$ $= \frac{4m(m-2n)}{3(m+3n)}$ <p>NPV's: <math>m \neq -3n, -4n, 7n, 0</math></p>                                                                                                                   |
| <p>m) <math>\frac{3x^2+3x-6}{x^2y-7xy} \times \frac{x^2y-13xy+42y}{6x^2+12x}</math></p> $\frac{(\cancel{3x+6})(\cancel{x-1})}{\cancel{xy}(\cancel{x-7})} \times \frac{y(\cancel{x-7})(x-6)}{6x(\cancel{x+2})}$ $= \frac{(x-1)(x-6)}{6x^2}$ <p>NPV's: <math>x \neq 0, 7, -2</math></p>                                                 | <p>n) <math>\frac{x+2y}{x-3y} \times \frac{x^2-9y^2}{x^2-4y^2} \div \frac{x+3y}{x-2y}</math></p> $\frac{\cancel{x+2y}}{\cancel{x-3y}} \times \frac{(\cancel{x-3y})(\cancel{x+3y})}{(\cancel{x-2y})(\cancel{x+2y})} \times \frac{x-2y}{\cancel{x+3y}}$ $= 1$ <p>NPV's: <math>y \neq 2y, -2y, 3y</math></p> | <p>o) <math>\frac{(3a+7b)^2}{2a-5b} \times \frac{4a^2-25b^2}{9a^2-49b^2} \div \frac{2a+5b}{3a-7b}</math></p> $\frac{(\cancel{3a+7b})(\cancel{3a+7b})}{2\cancel{a-5b}} \times \frac{(2\cancel{a-5b})(2\cancel{a+5b})}{(\cancel{3a+7b})(\cancel{3a-7b})} \times \frac{3\cancel{a-7b}}{2\cancel{a-5b}}$ $= 3a+7b$ <p>NPV's: <math>a \neq \frac{7b}{3}, \frac{5b}{2}, -\frac{7b}{3}, -\frac{5b}{2}</math></p> |

3. A student simplifies the following expressions shown below. Indicate all the mistakes shown:

|                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                          |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| $s1: \frac{x-5}{5-x}$<br>$s2: \frac{x-5}{5-x}$<br>$s3: \frac{x}{-x}$<br>$s4: \frac{1}{-1}$<br>$s5: -1$ <p><i>can't simplify like that!</i></p>                                                                                                                                           | $s1: \frac{a^2+6a+8}{a^2+8}$<br>$s2: \frac{a^2+6a+8}{a^2+8}$<br>$s3: \frac{a^2+6a}{a^2}$<br>$s4: \frac{a(a+6)}{a^2}$<br>$s5: \frac{a+6}{a}$ <p><i>can't simplify like that</i></p>                                                                                        | $s1: \frac{24a}{7b} \div \frac{13b}{21ab^3} \times \frac{3a}{b^2}$<br>$s2: \frac{24a}{7b} \times \frac{21ab^3}{13b} \times \frac{b^2}{3a}$<br>$s3: \frac{24a}{7b} \times \frac{21ab^3}{13b} \times \frac{b^2}{3a}$<br>$s4: \frac{24ab^2}{13}$ <p><i>one 'b' left</i></p> |
| $s1: \frac{a^2-16}{a+7} \div \frac{a^2+16}{a-7}$<br>$s2: \frac{a+7}{a^2-16} \times \frac{a^2+16}{a-7}$<br>$s3: \frac{a+7}{a^2-16} \times \frac{a^2+16}{a-7}$<br>$s4: \frac{1}{(a-4)(a+4)} \times \frac{(a+4)(a+4)}{-1}$<br>$s5: -\frac{a+4}{a-4} = -1$ <p><i>flip this fraction!</i></p> | $s1: \frac{x^2-6}{x+3} \div \frac{x^2-9}{x-3}$<br>$s2: \frac{(x+\sqrt{6})(x-\sqrt{6})}{x+3} \times \frac{x-3}{x^2-9}$<br>$s3: \frac{(x+\sqrt{6})(x-\sqrt{6})}{x+3} \times \frac{x-3}{(x-3)(x+3)}$<br>$s4: (x+\sqrt{6})(x-\sqrt{6})$ <p><i>can't cancel these two!</i></p> |                                                                                                                                                                                                                                                                          |

4. What are the NPV's of the following rational expression?  $\frac{2x}{x^2+9} \times \frac{3x^2}{x^2+1}$

$$\frac{2x}{(x+3)(x-3)} \times \frac{3x^2}{x^2+1}$$

*can't do anything with this*

NPV:  $x \neq \pm 3$

5. Simplify each of the following rational expressions and indicate the NPV

|                                                                                                                                                      |                                                |                                                           |
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| $a) \left( \frac{\frac{2}{3x} + 4}{5 - \frac{2}{x}} \right)$<br>$\frac{2+12x}{15x-6}$<br>$= \frac{2(1+6x)}{3(5x-2)}$<br>NPV: $x \neq \frac{2}{5}, 0$ | $b) \frac{\frac{1}{3} + 6x}{\frac{1}{9} - 3x}$ | $c) \frac{\frac{1}{4x} + 7x}{\frac{1}{6} - \frac{3}{2x}}$ |
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6. Simplify and find all the NPV's:

$$y + \frac{2y}{y+2} = \frac{y(y+2) + 2y}{(y+2)(y-2)} = \frac{y^2 + 2y + 2y}{(y+2)(y-2)} = \frac{y^2 + 4y}{(y+2)(y-2)}$$

$$1 + \frac{4}{y^2-4} = \frac{(y^2-4) + 4}{(y+2)(y-2)} = \frac{y^2}{(y+2)(y-2)}$$

$$= \frac{y^3 - 4y + 2y^2 - 4y}{y^2 - 4 + 4} = \frac{y^3 + 2y^2 - 8y}{y^2} = \frac{y^2 + 2y - 8}{y}$$

*(y+4)(y-2)*