

Name: _____

Date: _____

HW Pre-Calculus 11 Section 4.1 Rational Expressions and NPV

1. Given each algebraic expression, indicate which ones are rational expressions. Explain why or why not:

a) $y = \frac{x+2}{x-3}$ <i>Yes</i>	b) $y = \frac{12}{x}$ <i>Yes</i>	c) $y = \frac{\sqrt{x}}{x}$ <i>No</i> (with arrow pointing to $\sqrt{x}$)
d) $y = \frac{2^x + \sqrt{7}}{x^3 + 10x}$ <i>No, 'x' can't be an exponent</i>	e) $y = x^{-3} + 12x^{-2}$ <i>Yes</i>	f) $y = \frac{\sqrt{8x^3 + 2x^2 + 3}}{x^2 - 3}$ <i>Yes.</i>
g) $y = \frac{\sqrt{x^3} + 2x^2 + 3}{x^2 - 3}$ <i>No</i>	h) $y = 16x$ <i>Yes</i>	i) $y = 12$ <i>Yes</i>

2. Given each rational expression, find the non-permissible values

a) $\frac{2x}{(x-1)(x+4)}$ <i>NP.V. $x \neq 1, -4$</i>	b) $\frac{x-1}{x(x-1)(2x+5)}$ <i>$x \neq 0, 1, -\frac{5}{2}$</i>	c) $\frac{2x}{(x-3)(2x+7)}$ <i>$x \neq 3, -\frac{7}{2}$</i>
d) $\frac{5x}{(2x-3)+(3x-7)}$ <i>$\frac{5x}{5x-10}$ NP.V. $x \neq 2$</i>	e) $\frac{2x}{2x(4x+3)-3(4x+3)}$ <i>$\frac{2x}{(2x-3)(4x+3)}$ $x \neq \frac{3}{2}, -\frac{3}{4}$</i>	f) $\frac{6x}{x^2-2x-24}$ <i>$\frac{6}{(x-6)(x+4)}$ NP.V. $x \neq 6, -4$</i>
g) $\frac{5-2x}{3x^2-11x+6}$ <i>$\frac{5-2x}{(3x-2)(x-3)}$ $x \neq \frac{2}{3}, 3$</i>	h) $\frac{2x^2-3x}{12x^2-53x+56}$ <i>$\frac{2x^2-3x}{(4x-7)(3x-8)}$ $4-8=-32 \Rightarrow$ $3-7=-21 \Rightarrow$ $x \neq \frac{7}{4}, \frac{8}{3}$</i>	i) $\frac{8-2x}{2x^3+5x^2-12x}$ <i>$\frac{2x^2-3x}{x(2x^2+5x-12)}$ $x(2x-3)(x+4)$ $x \neq 0, \frac{3}{2}, -4$</i>
j) $\frac{3}{(x^2-16)(x^2+1)}$ <i>$\frac{3}{(x+4)(x-4)(x^2+1)}$ $x \neq \pm 4$</i>	k) $\frac{5}{x(x^3-8)(x^2+2)}$ <i>$\downarrow \downarrow$ $x \neq 0, x \neq 2$</i>	l) $\frac{2}{x^3+3x^2+3x+1}$ <i>$\frac{2}{(x+1)^3}$ $x \neq -1$</i>

3. Simplify each of the following rational expressions and indicate the NPV. Show all your work on how you factored each expression

a) $\frac{2x}{x(2x+3)}$ $\frac{2}{2x+3}$ NPV: $x \neq 0, -\frac{3}{2}$	b) $\frac{8x+2x^2}{x(4+x)}$ $\frac{2x(4+x)}{x(4+x)} = 2$ NPV: $x \neq 0, -4$	c) $\frac{6x-3}{x-2x^2}$ $\frac{3(2x-1)}{x(1-2x)} = -\frac{3}{x}$ NPV: $x \neq 0, \frac{1}{2}$
d) $\frac{3x-18}{x^2-4x-12}$ $\frac{3(x-6)}{(x-6)(x+2)} = \frac{3}{x+2}$ NPV: $x \neq 6, -2$	e) $\frac{2x-8}{x^2-16}$ $\frac{2(x-4)}{(x+4)(x-4)} = \frac{2}{x+4}$ NPV: $x \neq \pm 4$	f) $\frac{x^2+x-6}{x^2+5x+6}$ $\frac{(x+3)(x-2)}{(x+3)(x+2)} = \frac{x-2}{x+2}$ NPV: $x \neq -3, -2$
g) $\frac{x^2+x-20}{x^2+8x+15}$ $\frac{(x-4)(x+5)}{(x+5)(x+3)} = \frac{x-4}{x+3}$ NPV: $x \neq -5, -3$	h) $\frac{4x^2-9}{8x^2+18x+9}$ $\frac{(2x-3)(2x+3)}{(2x+3)(4x+3)} = \frac{2x-3}{4x+3}$ NPV: $x \neq -\frac{3}{2}, -\frac{3}{4}$	i) $\frac{12x^2-25x+12}{18x^2-39x+20}$ $\frac{(3x-4)(4x-3)}{(6x-5)(3x-4)} = \frac{4x-3}{6x-5}$ NPV: $x \neq \frac{5}{6}, \frac{4}{3}$
g) $\frac{3x^2-7xy+2y^2}{2x^2+7xy+3y^2}$ $\frac{(3x-y)(x-2y)}{(2x+y)(x+3y)}$ NPV: $x \neq -\frac{y}{2}, -3y$	h) $\frac{a^2+7ab+12b^2}{a^2-16b^2}$ $\frac{(a+4b)(a+3b)}{(a+4b)(a-4b)} = \frac{a+3b}{a-4b}$ NPV: $a \neq -4b, 4b$	i) $\frac{15a^2+16ab-7b^2}{15a^2-26ab+7b^2}$ $\frac{(5a+7b)(3a-b)}{(5a-7b)(3a-b)} = \frac{5a+7b}{5a-7b}$ NPV: $a \neq \frac{7b}{5}, \frac{b}{3}$

4. What is a non-permissible value? Define it using your own words

A VALUE THAT MAKES THE EXPRESSION UNDEFINED.
THIS HAPPENS WHEN THE DENOMINATOR IS EQUAL TO ZERO.

5. A student tries to simplify the expressions with the following steps. Find all the errors and correct it:

$\text{step1} := \frac{3x}{3x+2}$ $\text{step2} := \frac{3x}{3x-2}$ $\text{step3} := \frac{1}{2}$ ← THAT'S NOT ALLOWED b/c there's a plus sign	$\text{step1} := \frac{x-6}{6-x}$ $\text{step2} := \frac{x-6}{6-x}$ $\text{step3} := \frac{x}{-x}$ $\text{step4} := \frac{x}{-x}$ $\text{step5} := -1$ No! b/c there's a minus sign	$\text{step1} := \frac{6x^2-3x}{3x}$ $\text{step2} := \frac{3x(2x-1)}{3x}$ $\text{step3} := 2x-1$ yes it's o.k.
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6. Given the expression $\frac{15ab^3}{ab(7c+3)}$, list out all the NPV's:

$$a \neq 0 \quad b \neq 0 \quad c \neq -\frac{3}{7}$$

7. A rectangular board 12m by 16m has an area of 192cm². If you plan to reduce the width of the board and maintain the same area, the equation for the length will be: $L = \frac{192}{12-x}$, where "x" is how much you reduce the width by. What is the NPV of the equation for the length?

$$x \neq 12 //$$

8. Given the equation, find all the possible Non Permissible Values:

$$\frac{1}{x + \frac{2}{x+3}}$$

$$\textcircled{1} x+3 \neq 0$$

$$x \neq -3$$

$$\textcircled{2} x + \frac{2}{x+3} \neq 0$$

$$x \neq \frac{-2}{x+3}$$

$$x^2 + 3x \neq -2$$

$$x^2 + 3x + 2 = 0$$

$$(x+2)(x+1) \neq 0$$

$$x \neq -2, -1 //$$