MCR3U   **Lesson 3 Simplifying Rational Expressions**
Ms. Kueh   **Unit 2 Equivalent algebraic Expressions**

Warm up:

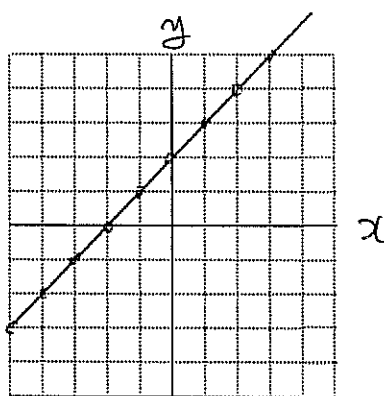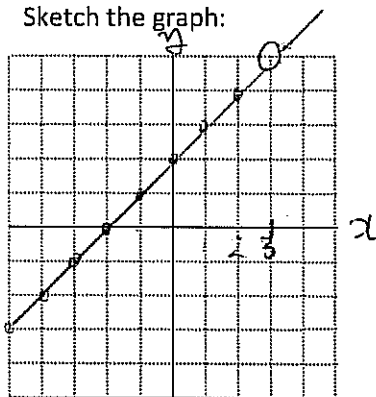Graph $y = \dfrac{x^2 - x - 6}{x - 3}$ = rational expression   and $y = x + 2$ linear expression

Table of values

x	y
ⓐ -2	0
ⓑ -1	1
0	2
1	3
2	4
3	undefined or does not exist
4	6

x	y
-2	0
-1	1
0	2
1	3
2	4
3	5
4	6

ⓐ $\dfrac{(-2)^2 - (-2) - 6}{(-2) - 3}$

$= \dfrac{4 + 2 - 6}{-5}$

$= \dfrac{0}{-5} = 0$

ⓑ $\dfrac{(-1)^2 - (-1) - 6}{(-1) - 3}$

$= \dfrac{1 + 1 - 6}{-4} = \dfrac{-4}{-4} = 1$

Sketch the graph:

Compare the graphs.

Algebraically, these two equations look the same, but their graphs
are different because of undefined area (or hole)

⚹ Note : Since you can not have zero denominator,
you must define restrictions on the variable, when
you solve rational expressions.

Quotient = a result obtained by dividing one quantity by another quantity.

*Feb 9

e.g) $x^2 - x - 6$

* Rational Expressions are quotients in which the numerator and denominator are polynomials.   e.g of R expression $\Rightarrow \dfrac{x^2 - x - 6}{x - 3}$

* 3 steps of solving rational expressions

① Factor it as much as possible. (Sometimes you skip step 1)
② Simplify or reduce as much as possible.
③ Define and state restrictions. $\rightarrow \dfrac{1}{2x^2}\left(10x^4 - 8x^2 + 4x\right)$

To solve rational expressions, factor the numerator and denominator where ever possible

Simplify the rational expressions and state any restrictions on the variables.

1) $\dfrac{30x^4 y^3}{-6x^7 y}$

$= 30x^4 y^3 \div -6x^7 y$

$= -5x^{-3}y^2 \Leftarrow -5x^{4-7}y^{3-1}$

$= \dfrac{-5y^2}{x^3}$, $x \neq 0$, $y \neq 0$

2) $\dfrac{10x^4 - 8x^2 + 4x}{2x^2} = \dfrac{2x\left(5x^3 - 4x + 2\right)}{2x \cdot x}$

$= \dfrac{(5x^3 - 4x + 2)}{x}$

$ac = 5 \times 2$ $b = -4$
$\quad = 10$

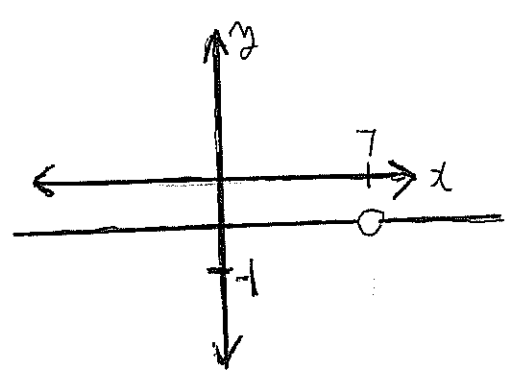$\therefore \dfrac{5x^3 - 4x + 2}{x}$, $x \neq 0$

* you must look at both the original equation and simplified equation when defining the restrictions.

$14 - 2x \neq 0$
$-2x \neq -14 \rightarrow x \neq 7$

3) $\dfrac{2x^2 + 3x - 2}{x^2 - 4}$

$\Rightarrow ac = 2 \times (-2) = -4$
$\quad b = 3$

$4 \times (-1)$ } step 1

$2x^2 + 4x - x - 2$
$2x(x + 2) - (x + 2)$
$(x + 2)(2x - 1)$

3) $\dfrac{(x + 2)(2x - 1)}{(x + 2)(x - 2)} \Rightarrow$

$\therefore \dfrac{(2x - 1)}{(x - 2)}$, $x \neq 2$, $x \neq -2$

4) $\dfrac{x - 7}{14 - 2x} = \dfrac{(x - 7)}{-2(x - 7)}$

$= \dfrac{1}{2}$, $x \neq 7 \rightarrow y = -\dfrac{1}{2}$