Math 105 TOPICS IN MATHEMATICS

REVIEW OF LECTURES – IX (SUPPLEMENT)

February 9 (Mon), 2015

Instructor: Yasuyuki Kachi

Line #: 52920.

Appendix to §9. Switching orders in prucut formation. Substituting a quantity with negative sign.

- **Switching the orders in product formation.**

We know

$$3 \cdot 4 \cdot 5, \qquad 3 \cdot 5 \cdot 4, \qquad 4 \cdot 3 \cdot 5,$$
$$4 \cdot 5 \cdot 3, \qquad 5 \cdot 3 \cdot 4 \quad \text{and} \quad 5 \cdot 4 \cdot 3$$

are all the same. They all equal 60. So, in a product formation, you are allowed to permute the numbers. When a letter is involved, the same principle remains true. For example,

$$3 \cdot x \cdot 5, \qquad \boxed{3 \cdot 5 \cdot x}, \qquad x \cdot 3 \cdot 5,$$
$$x \cdot 5 \cdot 3, \qquad \boxed{5 \cdot 3 \cdot x} \quad \text{and} \quad 5 \cdot x \cdot 3$$

are all equal. Now, when you are asked to simplify any of these, you would use either one of the two boxed ones, because $3 \cdot 5$ and $5 \cdot 3$ are readily calculated as 15. So, $15\,x$ is the result of simplification.

Exercise 1. Simplify each of

$$2 \cdot x \cdot 4, \qquad 3 \cdot x^2 \cdot 6, \qquad 20 \cdot x^3 \cdot 2^3.$$

$\Big[$ **Answers** $\Big]$**:**
$$\begin{aligned} 2 \cdot x \cdot 4 &= 2 \cdot 4 \cdot x = 8\,x, \\ 3 \cdot x^2 \cdot 6 &= 3 \cdot 6 \cdot x^2 = 18\,x^2, \\ 20 \cdot x^3 \cdot 2^3 &= 20 \cdot 2^3 \cdot x^3 = 160\,x^3. \end{aligned}$$

$\star$ Don't get distracted that a letter is squeezed in between two numbers.

- **Substituting a quantity with negative sign.**

  We know

$$\begin{aligned} 7 + \Big(-2\Big) &= 7 - 2 = 5. \\ 7 - \Big(-2\Big) &= 7 + 2 = 9. \end{aligned}$$

More generally,

$$\begin{aligned} x + \Big(-a\Big) &= x - a. \\ x - \Big(-a\Big) &= x + a. \end{aligned}$$

Exercise 2. Substitute $a = -4$ in $\Big(x+a\Big)^2$.

$\Big[$ **Answer** $\Big]$**:** $\Big(x-4\Big)^2$.

Exercise 3. Substitute $a = -6$ in $\Big(x-a\Big)^4$.

$\Big[$ **Answer** $\Big]$**:** $\Big(x+6\Big)^4$.