

New Book: MTH-3051
 Algebraic and Graphical
 modeling

April 29th
 2024

(first lesson)

Lesson 2: Simplifying Expression · Solving Equations

Recall: expressions v.s. equations
 Simplify:

Solve for x: · sub $y=16$
 · simplify
 · solve

ex 2: $3(2x+2) = y$

ex 1: $3(2x+2)$

$6x + 6$

ex 3: Simplify

$-2(2x^2 - 3x - 4)$

$-2(2x^2) + (-2)(-3x) + (-2)(-4)$

$-4x^2 + 6x + 8$

law of signs
 $\times \div$ adj signs

| | | | |
|---|---|---|---|
| + | + | = | + |
| - | - | = | + |
| + | - | = | - |

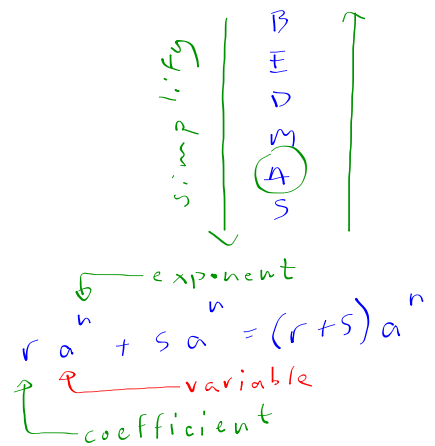
ex Simplify

$$-2x(x - 3y + 4y^2) + 4y$$

$$-2x + \underline{6y} - 8y^2 + \underline{4y}$$

$$-2x + 10y - 8y^2 \quad \checkmark$$

$$-8y^2 + 10y - 2x \quad (\text{better by convention})$$



ex Simplify

13

$$-(2x^2 - \underline{y} - \underline{4y}) - x^2$$

$$-\underline{1}x(2x^2 - \underline{5y}) - x^2$$

$$-\underline{2}x^2 + 5y - \underline{1}x^2$$

$$-3x^2 + 5y$$

laws of signs
addition

- + + = +
- - - = -
- + - = ?

ex. $-20 + 30 = 10$
 $20 + (-30) = -10$

law of signs
x $\frac{0}{0}$ adj signs

- + + = +
- - - = +
- + - = -

You do handout 1

ex. 3.1 / 3.2

Read above section 3 (and answers)

3 - explanation:

e.x. simplify:
 $(\underline{5-2})(\underline{2x+2})$

$$\begin{array}{r|l}
 \overbrace{3(2x+2)} & 3 \cdot (2x+2) \\
 6x+6 & = 2x+2 \\
 & 2x+2 \\
 + & 2x+2 \\
 \hline
 & 6x+6
 \end{array}$$

B
E
D
S

Recall

$$\begin{aligned}
 3 \times 2 & \\
 & = 2 + 2 + 2
 \end{aligned}$$

$$x^3 = x \cdot x \cdot x$$

ex. 3.1.

a)

$$3(-4x + \frac{2}{3})$$

$$3(-4x) + \frac{3}{1} \times \frac{2}{3}$$

$$-12x + \frac{\cancel{3} \times 2}{\cancel{3}}$$

$$-12x + 2$$

c)

$$5(2j + 4p - \frac{2}{3}k)$$

$$10j + 20p + \frac{5}{1} \times -\frac{2}{3}k$$

$$10j + 20p - \frac{10}{3}k$$

3.2.

$$a) \quad 4 \left(-2y + \frac{1}{4} \right)$$

$$-8y + \cancel{4} \times \frac{1}{\cancel{4}}$$

$$-8y + 1$$

$$c) \quad 3 \left(2j - \frac{2}{5}p - k \right)$$

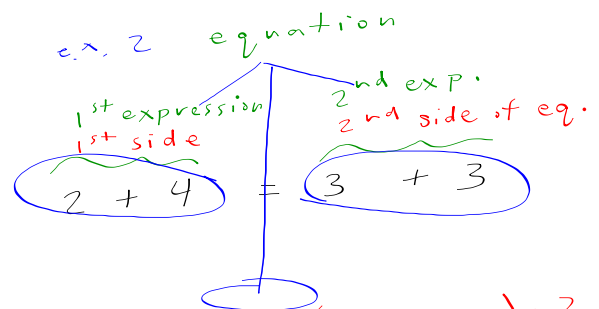
$$6j + \frac{3}{1} \times \frac{-2}{5}p - 3k$$

$$6j - \frac{6}{5}p - 3k$$

Recall:

ex. 1: expression

• $2 + 4$



$$2x(2 + 4) = (3 + 3)x2$$

do same thing to the whole other side!

ex 3

• $-2x + 3x + 1$

ex. 4 Solve for x given $y = 3x$

$$-2x + y + 1 = 10 \quad \begin{array}{l} \cdot \text{sub} \\ \cdot \text{simplify} \end{array}$$

$$-2x + 3x + 1 = 10 \quad \cdot \text{solve}$$

$$x + 1 = 10$$

$$-1 \quad -1$$

$$x = 9$$

Solve.

i. $x + \frac{1}{-1} = 4$
 $\quad \quad \quad -1 \quad \quad -1$

$x = 3$

ii. $-2 = 4 + y$
 $\quad -4 \quad \quad -4$

$-6 = y$

$y = -6$

iii. solve: / isolate

$3x \frac{x}{3} = -4 \times 3$

$x = -12$

You do:

- handout 2 ex. 4.1
- read section 4 at top a fill in blank

Solve \overline{w} o. o.
 • opposite operation

simplify
do the op.

S
T
R
S
D
E
B

solve/isolate
do the o.o.

\oplus -
 \times \div
 x^2 \sqrt{x}

check

$-2 = 4 + y$

$-2 = 4 + (-6)$

$-2 = -2 \checkmark$

iv. $\frac{4}{1} \times \frac{2}{3} = \frac{y}{4} \times 4$

$\frac{8}{3} = y$

$y = \frac{8}{3}$

Solve

$$\frac{15}{-5} = \frac{-\cancel{5} \times t}{-5}$$

negative sign (NOT subtraction)
 $t - 5$

$$t = -3$$

Solve

$$\frac{-\cancel{2}x}{-2} = \frac{3}{4}$$

$$x = \frac{3}{4} \times \frac{-1}{2}$$

$$x = \frac{-3}{8}$$

Solving Multi-step Equation

ex. 1 : Solve:

$$\begin{array}{r}
 15 + 5x = 25 \\
 -15 \quad -15
 \end{array}$$

$$\begin{array}{r}
 5x = 10 \\
 \cancel{5} \quad \cancel{5}
 \end{array}$$

$$x = 2$$

check

$$15 + 5x = 25$$

$$15 + 5(2) = 25$$

$$15 + 10 = 25$$

$$25 = 25 \quad \checkmark$$

step i. (o.o.)
 Do opposite operations to both sides
 which operation 1st?



Solve

$$\cancel{2}x \frac{\left(\frac{3}{4}x + 2\right)}{\cancel{2}} = -\frac{5}{\cancel{2}}x \frac{\cancel{2}}{1}$$

note: there are invisible/implicit brackets around numerators.

$$= -\frac{10}{2}$$

$$\frac{3}{4}x + \cancel{2} = -\frac{5}{\cancel{2}}$$

↑ (B)
F
D
M
A
S

$$\frac{\cancel{3} \cdot x}{\cancel{4}} = \frac{-7}{\cancel{4}}$$

$$x = \frac{-7}{1} \times \frac{4}{3}$$

$$x = \frac{-28}{3}$$

Solve

$$-4 - \frac{x}{3} = -2 + 4$$

$$3 \times \left(-\frac{x}{3} \right) = 2 \times 3$$

$$-x = 6$$

$$\frac{-1 \cdot x}{-1} = \frac{6}{-1}$$

$$x = -6$$

4.2

c). solve

↑
B
E
D
M
A
S

$$2x \left(\frac{-x + 3}{2} \right) = 7 \times 2$$

$$\frac{-x}{2} + 3 = 7$$

-3 -3

$$-x + 3 = 14$$

-3 -3

$$-x = 11$$

check:

$$\frac{-x + 3}{2} = 7 \quad \text{sub } x = -11$$

$$\frac{-x}{2} = 4$$

$$\frac{-1x}{-1} = \frac{11}{-1}$$

adjacent signs

$$\frac{-(-11) + 3}{2} = 7$$

simplify

B
E
D
M
A
S

+ or adjacent signs

$$x = -11$$

$$\frac{(11 + 3)}{2} = 7$$

check $x = -2$

$$\frac{4 - x}{2} = 3$$

$$\frac{14}{2} = 7$$

$$7 = 7 \quad \checkmark$$

Solving by 1st Evaluating and
 ex. Solve: Combining Like Terms

$$124 = x - \frac{4}{5} \cdot (x - 5)$$

$$124 = x - \frac{4}{5} \times \frac{x}{1} + \left(-\frac{4}{5}\right) \times \frac{-5}{1}$$

$$124 = x - \frac{4x}{5} + \frac{20}{5}$$

$$124 = x - \frac{4x}{5} + 4$$

$$124 = \frac{1}{5}x + 4$$

$$\frac{120}{\frac{1}{5}} = \frac{1}{5} \cdot x$$

$$x = 600$$

WANT: value of x

TOOL: an equation and isolating x
 $\rightarrow 2$ x 's though

\rightarrow evaluate

\rightarrow combine like terms

$$r a^n + s a^n = (r+s)a^n$$

\rightarrow solve

B
E
D
M
A
S

check optional

$$124 = x - \frac{4}{5}(x - 5)$$

sub $x = 600$

$$124 = 600 - \frac{4}{5}(600 - 5)$$

$$124 = 124 \quad \checkmark$$

You do: SOFAD MTH 3051

Pg 52 #2.4 } steps on pg 51

Pg 167 #4.3 } answer key
 page # @
 bottom of page

pg 52

#2.4 c) solve

$$\frac{1}{2}(x+2) = -\frac{1}{3}(x+3) \quad \text{evaluate}$$

$$\frac{1}{2} \cdot x + \frac{1}{2} \cdot \frac{2}{1} = -\frac{1}{3} \cdot x + \left(-\frac{1}{3}\right) \cdot \frac{3}{1}$$

$$\begin{aligned} 3 \cdot \frac{1}{2} \cdot x + 1 &= -\frac{1}{3}x - 1 \\ 3 \times 2 & \quad + \frac{1 \cdot x}{3 \cdot 2} \quad \quad \quad + \frac{1}{3}x \end{aligned}$$

$$\frac{5}{6}x + 1 = -\frac{1}{3}x - 1$$

$$\frac{5}{6}x = -\frac{2}{5/6}$$

$$x = -2 \times \frac{6}{5}$$

$$x = -\frac{12}{5}$$

You do: pg 167

Solve: · Verification
 · Check

$$d) \frac{1}{2} \left(2x - \frac{1}{4} \right) = \frac{2}{3} (x+1)$$