

Part 1: Algebra Skills

1. Simplify: $(5x^2 - 6x - 9) + (8x + 2x^2 + 3)$

$$\boxed{7x^2 + 2x - 6}$$

2. Multiply: $(5y^3z^5)(-3xy^3z^4)$

$$\boxed{-15xy^6z^9}$$

RULE: $a^m \cdot a^n = a^{m+n}$

3. Multiply: $(3a + 5)(3a - 7)$

$$3a \cdot 3a + 3a \cdot (-7) + 5 \cdot 3a + 5 \cdot (-7)$$

$$9a^2 - 21a + 15a - 35 = \boxed{9a^2 - 6a - 35}$$

4. Solve the following system of equations for x.

$$\begin{array}{r} x + 3y = 1 \\ 5x - 3y = -25 \\ \hline 6x = -24 \\ \frac{6x}{6} = \frac{-24}{6} \\ \boxed{x = -4} \end{array}$$

5. Solve the following system of equations for y.

$$\begin{array}{r} 4x + 3y = 9 \longrightarrow \\ -2(2x + 5y = 8) \longrightarrow \\ \hline 4x + 3y = 9 \\ -4x - 10y = -16 \\ \hline -7y = -7 \\ \frac{-7y}{-7} = \frac{-7}{-7} \\ \boxed{y = 1} \end{array}$$

6. Simplify: $(-3x^{-3})^{-2}$

$$= -3^{-2} \cdot (x^{-3})^{-2}$$

$$= \frac{1x^6}{(-3)^2} = \boxed{\frac{x^6}{9}}$$

RULE: $(a^m)^n = a^{m \cdot n}$

$$a^{-m} = \frac{1}{a^m}$$

7) Subtract: $(5x^2 + 7x) - (3x^2 - x + 9)$

$$5x^2 + 7x - 3x^2 + x - 9$$

$$\boxed{2x^2 + 8x - 9}$$

8) Find a factor of $4x^2 - 25x - 21$.

$$4x^2 - 20x + 3x - 21$$

$$4x(x-7) + 3(x-7)$$

$$\boxed{(x-7)(4x+3)}$$

$$a \cdot c = 4(-21) = -84$$

1	84
2	42
3	28

Factor by Grouping

9) Multiply: $\frac{15x^2y^3}{8xy} \cdot \frac{24x^2}{5xy^5}$

$$\frac{3 \cdot 5 \cdot 24 \cdot x^2 y^3}{8 \cdot 5 \cdot x^1 y^5} = \frac{3 \cdot 3 \cdot x^2}{1 \cdot y^2} = \boxed{\frac{9x^2}{y^2}}$$

Use $f(x) = 3x^2 - 2x + 5$ and $g(x) = 4x - 2$ for problems 10-13.

10) Find $f(2) - g(4)$.

$$= 3(2)^2 - 2(2) + 5 - (4(4) - 2)$$

$$= 12 - 4 + 5 - (14) = \boxed{-1}$$

11) Find $g(f(x))$.

$$g(f(x)) = 4(3x^2 - 2x + 5) - 2$$

$$= 12x^2 - 8x + 20 - 2$$

$$\boxed{g(f(x)) = 12x^2 - 8x + 18}$$

12) Find $g(f(-4))$

USE #11

$$g(f(-4)) = 12(-4)^2 - 8(-4) + 18 = 12(16) + 32 + 18$$

$$= 192 + 32 + 18 = \boxed{242}$$

HARD!

13) Find $f(g(x))$

$$f(g(x)) = 3(4x - 2)^2 - 2(4x - 2) + 5$$

$$= 3(4x - 2)(4x - 2) - 8x + 4 + 5$$

$$= 3(4x^2 - 8x + 4) - 8x + 9$$

$$= 3(4x^2 - 16x + 4) - 8x + 9$$

$$= 12x^2 - 48x + 12 - 8x + 9$$

$$\boxed{f(g(x)) = 12x^2 - 56x + 21}$$

14. What is the vertex of $y = x^2 - 4x + 3$?

FORMULAS: X VALUE OF THE VERTEX:

$$x = \frac{-b}{2a}$$

$$x = \frac{-b}{2a} = \frac{-4}{2(1)} = \frac{-4}{2} = -2$$

$$x = 2$$

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

$$y = 4 - 8 + 3$$

$$y = -1$$

$$(2, -1)$$

15. Solve $2x^2 + 5x - 12 = 0$.

$$(2x - 3)(x + 4) = 0$$

$$2x - 3 = 0$$

$$+3 \quad +3$$

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

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

$$x + 4 = 0$$

$$-4 \quad -4$$

$$x = -4$$

16. Write in lowest terms:

$$\frac{x^2 - 4x - 12}{x^2 - 9x + 18}$$

$$= \frac{(x-6)(x+2)}{(x-6)(x-3)}$$

← FACTOR FIRST BY GUESS AND CHECK

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

17. Graph. Is (1,0) a solution to this system of linear inequalities?

$$x = 1$$

$$y = 0$$



$$3x + 4y < 12 \rightarrow 3(1) + 4(0) < 12 \rightarrow 3 < 12 \checkmark \text{ YES}$$

$$y < \frac{1}{2}x + 5 \rightarrow 0 < \frac{1}{2}(1) + 5 \rightarrow 0 < 5\frac{1}{2} \checkmark \text{ YES}$$

$$y > -3$$

$$0 > -3 \rightarrow 0 > -3 \checkmark \text{ YES}$$

$$\boxed{\text{YES}}$$

WORKS IN ALL THREE

18. Find the solution(s) of $y = 2x^2 - 3x - 35$

$$0 = 2x^2 - 3x - 35$$

$$0 = (2x - 7)(x + 5)$$

← FACTOR BY GUESS AND CHECK

$$2x - 7 = 0$$

$$+7 \quad +7$$

$$2x = 7$$

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

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

$$x + 5 = 0$$

$$-5 \quad -5$$

$$x = -5$$