Session 4.3

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Notes to keep in mind

Make sure you have these things in your notes, because I will refer to them with the expectation that you have learned, memorized, or written them down.

1. Solving a system of equations with the **<u>substitution method</u>**

$$\begin{cases} 5x - 2y = 8 \\ y = x - 1 \end{cases} \xrightarrow{\text{substitute}} 5x - 2(x-1) = 8 \xrightarrow{\text{solve}} \boxed{x = 2} \xrightarrow{\text{plug in}} y = (2) - 1 \xrightarrow{\text{solve}} \boxed{y = 1}$$

2. Solving a system of equations with the **<u>elimination method</u>**

$$\begin{cases} 4x - 7y = -12 \\ -3x + 6y = 9 \end{cases} \xrightarrow{\text{multiply}} \begin{cases} 12x - 21y = -36 \\ -12x + 24y = 36 \end{cases} \xrightarrow{\text{add}} 3y = 0 \xrightarrow{\text{solve}} \boxed{y = 0} \xrightarrow{\text{plug in}} -3x + 6(0) = 9 \xrightarrow{\text{solve}} \boxed{x = -3}$$

3. Solving for x in an absolute value equation, such as $-2|x+3| + 8 = -10$

   (a) Isolate the absolute value: $-2 * |x+3| + 8 = -10 \implies -2 * |x+3| = -18 \implies |x+3| = 9$

   (b) Identify the two possibilities: $|x+3| = |9| = |-9| = 9$

   (c) Set the "inside" equal to the "inside": $x + 3 = 9$ **<u>and</u>** $x + 3 = -9$

   (d) Solve for x: $\boxed{x = 6}$ **<u>and</u>** $\boxed{x = -12}$

4. Factoring a polynomial from $x^2 + b*x + c$ into $(x+u)(x+v)$,

   (a) Remember that $b = u + v$ and $c = u * v$

   (b) Start by factoring out c, such as $24 = 1 * 24 = 2 * 12 = 3 * 8 = 4 * 6$

   (c) See if any pair of factors add up to equal b

   (d) If c is positive, that means u and v are both either positive or negative

   (e) If c is negative, one is positive and the other is negative

Main problems

1. Find all points on the following graphs with the specified value of y

   (a) $y = |\frac{3}{4}x + \frac{3}{8}|$ where $y = 3$ (c) $y = -\frac{1}{2} * |\frac{2}{5}x + 4| - 5$ where $y = -9$
   (b) $y = |3 - \frac{2}{3}x|$ where $y = 5$

2. For each of the systems of equations, find the (x, y) solution.

   (a) $\begin{cases} 13x + 20y = 4 \\ y = -x \end{cases}$ (b) $\begin{cases} -3x - 14y = 1 \\ y = x + 1 \end{cases}$ (c) $\begin{cases} -13x + 4y = -5 \\ y = -x + 3 \end{cases}$

(d) $\begin{cases} -4x + 9y = 0 \\ y = 4x - 1 \end{cases}$
(g) $\begin{cases} -8y - 10x = 19 \\ x = -\frac{8}{5}y - 2 \end{cases}$
(j) $\begin{cases} 7x - y = -11 \\ 2x - 3y = 10 \end{cases}$

(e) $\begin{cases} -2x - 5y = 14 \\ y = -3x + 8 \end{cases}$
(h) $\begin{cases} -2x - 4y = -2 \\ -4x + y = 14 \end{cases}$
(k) $\begin{cases} 3x - 8y = 12 \\ -9x - 2y = 17 \end{cases}$

(f) $\begin{cases} 5y - 7x = 4 \\ x = \frac{6}{7}y + 5 \end{cases}$
(i) $\begin{cases} -x + 4y = -6 \\ -2x + 5y = -11 \end{cases}$
(l) $\begin{cases} 12x - 9y = -3 \\ 3y - 4x - 9 = 0 \end{cases}$

3. Simplify each of the following polynomials

   (a) Add $-11x^2 - 2x - 15$ to $3x - 5$ (d) Multiply/expand $(x - 6)^2$

   (b) Subtract $-10x^2 - 10x + 1$ from $-4x^2 - 15x + 7$ (e) Multiply/expand $(x - 2)(x - 4)$

   (c) Subtract $-14x^2 + 6$ from $-x^2 - 4x + 9$ (f) Multiply/expand $(x - 5)(x + 6)$

4. Graph each of the following quadratic polynomials. Denote the min/max point and x-intercept(s).

   (a) $y = x^2$ (e) $y = -x^2$ (i) $y = -(x + 3)^2$

   (b) $y = x^2 + 2$ (f) $y = 1/2 * x^2$ (j) $y = 2(x + 5)^2$

   (c) $y = x^2 - 6$ (g) $y = (x - 4)^2$ (k) $y = -(x - 5)^2 - 7$

   (d) $y = 3x^2$ (h) $y = (x + 2)^2$ (l) $y = (x + 3)^2 + 5$

5. In general, what happens if we add c (a constant)?

6. In general, what happens if we multiply the polynomial by -1?

7. In general, what happens if we add c (a constant) inside the quadratic?

8. Factor each of the following, and list the x-intercepts:

   (a) $y = x^2 + 6x + 9$ (j) $y = x^2 - 16$ (s) $y = x^2 - 14x + 45$

   (b) $y = x^2 + 24x + 144$ (k) $y = 3x^2 - 75$ (t) $y = x^2 - 18x + 17$

   (c) $y = x^2 - 18x + 81$ (l) $y = 4x^2 - 9$

   (d) $y = x^2 - 10x + 25$ (m) $y = 16x^2 - 36$ (u) $y = x^2 - 3x - 28$

   (e) $y = x^2 - 22x + 121$ (n) $y = x^2 - 144/9$ (v) $y = x^2 - 8x - 65$

   (f) $y = 3x^2 - 12x + 12$ (o) $y = x^2 - 81/16$

   (g) $y = -2x^2 - 28x - 98$ (p) $y = x^2 + 13x + 40$ (w) $y = 3x^2 + 9x - 30$

   (h) $y = x^2 - 49$ (q) $y = x^2 + 14x + 48$ (x) $y = -2x^2 + 36x - 34$

   (i) $y = x^2 - 121$ (r) $y = x^2 - 2x - 8$ (y) $y = -4x^2 + 12x + 216$

More problems

1. Work on 2014 ICTM 1A/2A: http://www.ilmathcontest.com/hs/Questions/Reg/R14A.pdf

2. Use the "Noah sheets": http://teachers.edenpr.org/ mkingsbury/mathteam/NoahSheets.pdf