

Session 5.2

Mr. Hernandez: josehdz@cs.stanford.edu

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 **substitution method**

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

2. Solving a system of equations with the **elimination method**

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

3. 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. Solve the following system of equations for the (x, y) solution

(a) $\begin{cases} 9x - 4y = 15 \\ y = 3x - 3 \end{cases}$

(e) $\begin{cases} -2x + 3y = -1 \\ 2x + 5y = 25 \end{cases}$

(i) $\begin{cases} 2x - y = 9 \\ 3x + 4y = -14 \end{cases}$

(b) $\begin{cases} -3x + 2y = 15 \\ y = -x + 4 \end{cases}$

(f) $\begin{cases} 2x + y = 12 \\ -3x + y = 2 \end{cases}$

(j) $\begin{cases} 4x - 3y = 25 \\ -3x + 8y = 10 \end{cases}$

(c) $\begin{cases} 7y - 5x = -10 \\ x = -\frac{7}{5}y + 2 \end{cases}$

(g) $\begin{cases} 2x + y = 9 \\ 3x - y = 16 \end{cases}$

(k) $\begin{cases} 3x + 4y = 52 \\ 5x + y = 30 \end{cases}$

(d) $\begin{cases} 5y - 7x = 4 \\ x = \frac{6}{7}y + 5 \end{cases}$

(h) $\begin{cases} x - 2y = 9 \\ x + 3y = 16 \end{cases}$

(l) $\begin{cases} 12x - 3y = 6 \\ 4x - y = 2 \end{cases}$

2. 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 $(x - 5)(x + 6)$

3. Graph each of the following quadratic polynomials. Describe how the graph differs from $y = x^2$ using phrases like, “nothing”, or “up 2, then left 4, then reflected about x-axis”.

- (a) $y = x^2$ (f) $y = (x + 2)^2$ (k) $y = 3x^2$
 (b) $y = x^2 + 2$ (g) $y = -(x + 3)^2$ (l) $y = 1/2 * x^2$
 (c) $y = x^2 - 6$ (h) $y = 2(x + 5)^2$ (m) $y = 2(x + 5)^2$
 (d) $y = -x^2$ (i) $y = -(x - 5)^2 - 7$ (n) $y = 2(x + 5)^2$
 (e) $y = (x - 4)^2$ (j) $y = (x + 3)^2 + 5$ (o) $y = -(4x + 12)^2 - 3$

4. For each of the following transformations to $y = x^2$, write the quadratic equation in some form.

- (a) Up 3 (i) Left 3, then reflected about x-axis
 (b) Down 7 (j) Down 4, then reflected about x-axis
 (c) Right 2 (k) Left 13, then up 7, then reflected about x-axis
 (d) Left 5 (l) Up 4, then left 13, then vertical stretch by 2
 (e) Left 3, then down 7 (m) Reflected about x-axis, then right 4, vertical compress by 3
 (f) Right 3, then up 4 (n) Down 6, then vertical compress by 2, then reflected about x-axis
 (g) Left 2, then down 5
 (h) Reflected about x-axis

5. Complete the squares of each graph, and describe the shift happening in words.

- (a) $x^2 + 4x + 20$ (g) $x^2 - 14x + 20$ (m) $4x^2 - 24x + 20$
 (b) $x^2 + 6x + 12$ (h) $x^2 - 8x - 5$ (n) $2x^2 - 8x + 3$
 (c) $x^2 - 10 + 30$ (i) $x^2 + 16x + 30$ (o) $-2x^2 + 10x - 7$
 (d) $x^2 - 2x - 15$ (j) $-x^2 + 4x + 3$ (p) $x^2 - 3x + 1$
 (e) $x^2 + 6x - 5$ (k) $-x^2 - 8x + 24$ (q) $-2x^2 - 2x + 4$
 (f) $x^2 - 10x + 2$ (l) $-x^2 - 6x + 7$ (r) $-3x^2 - 24x + 24$

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

- (a) $y = x^2 + 6x + 9$ (j) $y = x^2 - 16$ (s) $y = x^2 - 2x - 8$
 (b) $y = x^2 + 24x + 144$ (k) $y = 3x^2 - 75$ (t) $y = x^2 - 14x + 45$
 (c) $y = x^2 - 18x + 81$ (l) $y = 4x^2 - 9$ (u) $y = x^2 - 18x + 17$
 (d) $y = x^2 - 10x + 25$ (m) $y = 16x^2 - 36$ (v) $y = x^2 - 3x - 28$
 (e) $y = x^2 - 22x + 121$ (n) $y = x^2 - 144/9$ (w) $y = x^2 - 8x - 65$
 (f) $y = 3x^2 - 12x + 12$ (o) $y = x^2 - 81/16$ (x) $y = 3x^2 + 9x - 30$
 (g) $y = -2x^2 - 28x - 98$ (p) $y = x^2 + 10x + 21$ (y) $y = -2x^2 + 36x - 34$
 (h) $y = x^2 - 49$ (q) $y = x^2 + 13x + 40$ (z) $y = -4x^2 + 12x + 216$
 (i) $y = x^2 - 121$ (r) $y = x^2 + 14x + 48$