

Session 5.3

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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 **elimination method**

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

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

- Remember that $b = u + v$ and $c = u * v$
- Start by factoring out c , such as $24 = 1 * 24 = 2 * 12 = 3 * 8 = 4 * 6$
- See if any pair of factors add up to equal b
- If c is positive, that means u and v are both either positive or negative
- 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)
$$\begin{cases} 9x - 4y = 15 \\ y = 3x - 3 \end{cases}$$

(f)
$$\begin{cases} x - 5y = 5 \\ 3x + y = 31 \end{cases}$$

(k)
$$\begin{cases} x + 7y = 24 \\ x - 9y = -24 \end{cases}$$

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

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

(l)
$$\begin{cases} 3x + 2y = 8 \\ 4x - 3y = -12 \end{cases}$$

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

(h)
$$\begin{cases} 3x + 4y = 21 \\ 3x - 3y = 4 \end{cases}$$

(m)
$$\begin{cases} 5x + 2y = 8 \\ 3x - 5y = 11 \end{cases}$$

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

(i)
$$\begin{cases} y + 2x = 5 \\ 3x2y = 4 \end{cases}$$

(n)
$$\begin{cases} 4x + 3y = 1 \\ 5x - 4y = 9 \end{cases}$$

(e)
$$\begin{cases} 2x - y = 8 \\ x + 3y = 4 \end{cases}$$

(j)
$$\begin{cases} 3x + 2y = 24 \\ x + 3y = 3 \end{cases}$$

(o)
$$\begin{cases} 2x + 5y = 11 \\ 3x + 8y = 16 \end{cases}$$

2. 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) $y = x^2$

(d) $y = -x^2$

(g) $y = -(x + 3)^2$

(b) $y = x^2 + 2$

(e) $y = (x - 4)^2$

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

(c) $y = x^2 - 6$

(f) $y = (x + 2)^2$

(i) $y = (x - 4)^2 - 3$

(j) $y = -(x - 5)^2 - 7$	(l) $y = 1/2 * x^2$	(n) $y = -2(x - 3)^2$
(k) $y = 3x^2$	(m) $y = 2(x + 5)^2$	(o) $y = -(4x + 12)^2 - 3$

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

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|----------------------------|--|
| (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 | |

4. Simplify each of the following polynomials

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|--|--------------------------------------|
| (a) Add $-11x^2 - 2x - 15$ to $3x - 5$ | (f) Multiply/expand $(x - 3)^2$ |
| (b) Subtract $-10x^2 - 10x + 1$ from $-4x^2 - 15x + 7$ | (g) Multiply/expand $(x - 4)^2$ |
| (c) Subtract $-14x^2 + 6$ from $-x^2 - 4x + 9$ | (h) Multiply/expand $(x - 6)^2$ |
| (d) Multiply/expand $(x + 2)^2$ | (i) Multiply/expand $(x + 12)^2$ |
| (e) Multiply/expand $(x + 5)^2$ | (j) Multiply/expand $(x + 4)(x + 5)$ |

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

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|-------------------------|---------------------------|----------------------------|
| (a) $y = x^2 + 8x + 16$ | (d) $y = x^2 - 18x + 81$ | (g) $y = x^2 - 22x + 121$ |
| (b) $y = x^2 - 4x + 4$ | (e) $y = x^2 - 10x + 25$ | (h) $y = 3x^2 - 12x + 12$ |
| (c) $y = x^2 + 6x + 9$ | (f) $y = x^2 + 24x + 144$ | (i) $y = -2x^2 - 28x - 98$ |

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

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|---------------------|----------------------|------------------------|
| (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) $-3x^2 - 24x + 24$ |

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

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|-----------------------|--------------------------|-----------------------------|
| (a) $y = x^2 - 49$ | (h) $y = x^2 - 81/16$ | (o) $y = x^2 - 18x + 17$ |
| (b) $y = x^2 - 121$ | (i) $y = x^2 + 10x + 21$ | (p) $y = x^2 - 3x - 28$ |
| (c) $y = x^2 - 16$ | (j) $y = x^2 + 13x + 40$ | (q) $y = x^2 - 8x - 65$ |
| (d) $y = 3x^2 - 75$ | (k) $y = x^2 + 14x + 48$ | (r) $y = 3x^2 + 9x - 30$ |
| (e) $y = 4x^2 - 9$ | (l) $y = x^2 - 2x - 8$ | (s) $y = -2x^2 + 36x - 34$ |
| (f) $y = 16x^2 - 36$ | (m) $y = x^2 - 15x - 34$ | (t) $y = -4x^2 + 12x + 216$ |
| (g) $y = x^2 - 144/9$ | (n) $y = x^2 - 14x + 45$ | |