Opening Exercise:

Solve each of the following system of equations algebraically:

\[
\begin{align*}
3(2x + 5y) &= 5 \\
3(3x + 2y) &= -9
\end{align*}
\Rightarrow

\begin{align*}
6x + 15y &= 15 \\
9x + 6y &= -18
\end{align*}
\]

\[
\begin{align*}
\Rightarrow &
\begin{align*}
11y &= 33 \\
y &= 3
\end{align*}
\end{align*}
\]

\[
\begin{align*}
2x + 5(3) &= 5 \\
2x + 15 &= 5 \\
-15 &= -15
\end{align*}
\Rightarrow

\begin{align*}
x &= -5
\end{align*}
\]

**Solution:** \((-5, 3)\)

\[
\begin{align*}
3(4x + 10y) &= 10 \\
3(6x + 4y) &= -18
\end{align*}
\Rightarrow

\begin{align*}
12x + 30y &= 30 \\
18x + 12y &= -18
\end{align*}
\]

\[
\begin{align*}
\Rightarrow &
\begin{align*}
12x &= 12 \\
x &= -5
\end{align*}
\end{align*}
\]

**Solution:** \((-5, 3)\)

What do you notice about the solutions? **They are the same!**

How are these systems related? **The second system is a multiple of the first (every term is \(x2\).**

**Adding a multiple of one equation to another creates a new system of two linear equations with the **SAME solution set as the original system. **
2. Which system of equations has the same solution as the system below?

\[
\begin{align*}
2x + 2y &= 16 \\
3x - y &= 4
\end{align*}
\]

| Option | System
|--------|--------|
| (1)    | \(2x + 2y = 16\)  \\
|        | \(6x - 2y = 4\)  |
| (2)    | \(2x + 2y = 16\)  \\
|        | \(6x - 2y = 8\)  |
| ✗      | \(x + y = 16\)   \\
|        | \(3x - y = 4\)   |
| ✗      | \(6x + 6y = 48\) \\
|        | \(6x + 2y = 8\)  |
| ✗      | \(5x + 2y = 21\) \\
|        | \(10x + 5y = 42\) |

3. Albert says that the two systems of equations shown below have the same solutions.

<table>
<thead>
<tr>
<th>First System</th>
<th>Second System</th>
</tr>
</thead>
<tbody>
<tr>
<td>(8x + 9y = 48)</td>
<td>(8x + 9y = 48)</td>
</tr>
<tr>
<td>(12x + 5y = 21)</td>
<td>(-8.5y = -51)</td>
</tr>
</tbody>
</table>

Determine and state whether you agree with Albert. Justify your answer.

\[
\begin{align*}
3(8x + 9y &= 48) \\
-2(12x + 5y &= 21)
\end{align*}
\]

\[
\begin{align*}
24x + 27y &= 144 \\
-24x - 10y &= -42
\end{align*}
\]

\[
\begin{align*}
17y &= 102 \\
y &= 6
\end{align*}
\]

\[
\begin{align*}
8x + 9(6) &= 48 \\
8x + 54 &= 48
\end{align*}
\]

\[
\begin{align*}
8x &= -6 \\
x &= -\frac{3}{4}
\end{align*}
\]

Solution: \((-\frac{3}{4}, 6)\)
1.) Draw the graph of the function  \( y = 2x^2 \).

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
</tr>
</thead>
<tbody>
<tr>
<td>-2</td>
<td>8</td>
</tr>
<tr>
<td>-1</td>
<td>2</td>
</tr>
<tr>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>8</td>
</tr>
</tbody>
</table>

2.) Factor each expression completely:
   
   a. \( 3x^3 + 30x^2 + 75x \)
      
      \[3x(x^2 + 10x + 25)\]
      
      \[3x(x+5)(x+5)\]
   
   b. \( 4 - x^2 \)
      
      \[(2-x)(2+x)\]
   
   c. \( x^4 + 11x^2 + 24 \)
      
      \[A_{\text{M}}\]
      
      \[(x^2 + 8)(x^2 + 3)\]

3.) The perimeter of a rectangular tennis court is 228 feet. If the length of the court exceeds twice its width by 6 feet, find the dimensions of the court.

\[\text{Let } w = \text{width} = 3w \text{ ft}\]

\[\text{Let } 2w + 6 = \text{length} = 2(3w) + 6 = 78 \text{ ft}\]

\[w + w + 2w + 6 - 2w + 6 = 228\]

The length is 78 ft and the width is 36 ft.
4.) Jorge babysits for \( x \) hours a week after school that pays \$6\) an hour and works \( y \) hours a week at a tutoring job making \$8\) an hour. Jorge will work both jobs but can work no more than 20 hours a week. Jorge wants to earn \textit{at least} \$72\) a week, working a combination of both jobs.

Write a system of inequalities that can be used to represent the situation.

\[
\begin{align*}
6x + 8y &\geq 72 \\
x + y &\leq 20
\end{align*}
\]

Let \( x = \) \# of hours babysitting

Let \( y = \) \# of hours tutoring

Graph these inequalities on the set of axes below.

State one combination of hours that will allow Jorge to make \textit{at least} \$72\) while working no more than 20 hours.

\((8, 9)\) 8 hours babysitting and 9 hours tutoring.
#5d \quad x^4 - 14x^2 - 82

(Skip #9 for now)