Solving a System Graphically

Graph both equations. Each intersection point is a solution for the system.

5. Solve graphically

\[
\begin{align*}
y_1 &= x^2 + 6 & \text{(parabola)} \\
y_2 &= 2x + 6 & \text{(line)}
\end{align*}
\]

Window: \(x_{\text{min}} = -10\)
\(x_{\text{max}} = 10\)
\(y_{\text{min}} = -10\)
\(y_{\text{max}} = 10\)

Do the step two times to find both intercepts:
\((0, 6)\) \((1, 10)\)

Solving a Nonlinear System by Substitution or Elimination

\[
\begin{align*}
x^2 + y^2 + 4y - 3x &= 0 \\
x^2 + y^2 + 4y + 3x &= 3 \\
\end{align*}
\]

\[
\begin{align*}
x^2 - y + 3 &= 0 \\
y &= -x - 3 \\
\end{align*}
\]
Solving a system graphically
Graph both equations, each intersection point is a solution for the system.

3. Solve graphically
\[
\begin{align*}
  y_1 &= x^2 + 6 \\ y_2 &= 2x + 6
\end{align*}
\] (parabola) (line)

WINDOW \[\text{Ymin} = -10 \quad \text{Ymax} = 10 \quad \text{Xmin} = -20 \quad \text{Xmax} = 20\]

CALC
[2nd] [TRACE] [5] 1st curve [ENTER] 2nd curve [ENTER] and curve [ENTER] [GUESS] [ENTER]

Do the steps two times to find both intercepts
\((0, 6) \quad (2, 10)\)

Solving a nonlinear system by substitution or elimination

17. Solve for \(y_1\), then substitute
\[
\begin{align*}
  x - x + y^2 + 3 &= 0 \\
  x^2 + y^2 + 4y - 3x &= -3
\end{align*}
\]

\[x + y + 3 = 0\]

\[y = -x - 3\]
Substitute unto the other equation:

\[
y = -x - 3
\]

\[
x^2 + y^2 + 4y - 3x = -3
\]

\[
x^2 + (-x - 3)^2 + 4(-x - 3) - 3x = -3
\]

\[
(x^2 + 6x + 9) - 4(x + 12) - 3x = -3
\]

Goal: Get "0"

\[
2x^2 - x - 3 = 0
\]

GCF:

\[
x(2x - 1) = 0
\]

\[
x = 0 \quad 2x - 1 = 0
\]

(0, 3)

\[
x = \frac{1}{2}
\]

\[
x = \frac{1}{2}
\]

Class chooses \( y = -x - 3 \)

If \( x = 0 \) then

\[
y = 0 - 3 = -3
\]

(0, -3)

If \( x = \frac{1}{2} \) then

\[
y = -\frac{1}{2} - 3 = -\frac{7}{2}
\]

\[
y = -\frac{1}{2} - \frac{6}{2} = -\frac{7}{2}
\]

\[
y = -\frac{7}{2} + \frac{7}{2} = 0
\]
<table>
<thead>
<tr>
<th>(0, -3)</th>
<th>(x + y + 3 = 0)</th>
<th>(x^2 + y^2 + 4y - 3x = -3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 = 0</td>
<td>(-3 = -3)</td>
<td></td>
</tr>
<tr>
<td>((\frac{5}{2}, -\frac{3}{2}))</td>
<td>(0 = 0)</td>
<td>(-3 = -3)</td>
</tr>
</tbody>
</table>

\[0, \text{ STO} \] \[x, t, \theta, n\] [Enter]  
\[(-3, 3), \text{ STO} \] \[\alpha \] \[A\] [Enter]  
*Enter both equations*

\[y = \alpha [A]\]

\[\frac{1}{2}, \text{ STO} \] \[x, t, \theta, n\] [Enter]  
\[(-3)[3], \text{ STO} \] \[\alpha \] \[A\] [Enter]  
*Enter both equations*

The final exam for the...

10am class is Tuesday 4/26 10am - 12:30pm in this room

11:30am class is Thursday 4/28 10am - 12:30pm in this room

The text review and study sheet is on prof.'s website.
38. The difference of two numbers is 2 and the sum of their squares is 10. Find the numbers.

1. Read. Identify what you are being asked to find. Define a variable for each unknown.

- \( x = \) the first number
- \( y = \) the second number

2. Solve and substitute.

- \( x - y = 2 \) \[1\]
- \( x^2 + y^2 = 10 \) \[2\]

- \( x = 2 + y \)

- \( (x^2 + y^2) = 10 \)

- \( 4 + 4y + y^2 + y^2 = 10 \)

- \( 4 + 4y + 2y^2 = 10 \)

- \( -10 \)

- \( -6 + 4y + 2y^2 = 0 \)

- \( 2y^2 + 4y - 6 = 0 \)

- \( \frac{2y^2 + 4y - 6}{2} = 0 \)

- \( 2(y^2 - 2y - 3) = 0 \)
\[2(y + 3)(y - 1) = 0\]

\[x = 0, y + 3 = 0, y - 1 = 0\]

Solution \(y = -3, y = 1\)

\((-1, -3), (3, 1)\)

\[x = 2 + y\]

If \(y = -3\)

\[x = 2 + (-3)\]

\[x = -1\]

\((-1, -3)\)

If \(y = 1\)

\[x = 2 + 1\]

\[x = 3\]

\((3, 1)\)

<table>
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<tr>
<th>(x - y = 2)</th>
<th>(x^2 + y^2 = 10)</th>
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<td>((-1, -3))</td>
<td>(2 = 2)</td>
</tr>
<tr>
<td>((3, 1))</td>
<td>(2 = 2)</td>
</tr>
</tbody>
</table>

\([-1] [\text{STO}] [x, t, \theta, n] [\text{ENTER}]\)

\([-3] [\text{STO}] [\text{ALPHA}] [1] [\text{ENTER}]\)

Enter the equations.
\( \sqrt[5]{7x^2 - 13y^2} - 49 = 0 \)

\[ 4x^2 + 4y^2 = 98 \]

No "x" or "y" \( \Rightarrow \) use elimination

Goal: Create term opposite

\[ 4 \left( 7x^2 - 3y^2 - 49 = 0 \right) \]
\[ 3 \left( 4x^2 + 4y^2 = 98 \right) \]

\[ 28x^2 - 12y^2 - 196 = 0 \]
\[ + \]
\[ 12x^2 + 12y^2 = 294 \]

\[ 40x^2 + 0 - 196 = 294 \]
\[ + \]
\[ 196 + 196 \]

Goal: Isolate the variable

\[ \frac{40x^2}{40} = \frac{490}{40} \]
\[ x^2 = \frac{49}{4} \]
\[ x = \pm \sqrt{\frac{49}{4}} \]
\[ x = \pm \frac{7}{2} \]

\( \Rightarrow x = \frac{7}{2} \) \( \Rightarrow x = -\frac{7}{2} \)

\[ \left( \frac{7}{2}, \cdot \right) \] \[ \left( -\frac{7}{2}, \cdot \right) \]
Inga chooses \( 4x^2 + 4y^2 = 98 \)

If \( x = \frac{3}{2} \) then

\[
4 \left( \frac{3}{2} \right)^2 + 4y^2 = 98
\]

\[
4 \left( \frac{3}{2} \right)^2 + 4y^2 = 98
\]

\[
\frac{4 \left( \frac{3}{2} \right)^2}{1} + 4y^2 = 98
\]

\[
4 \left( \frac{3}{2} \right)^2 + 4y^2 = 98
\]

\[
y = \pm \sqrt{\frac{49}{4}}
\]

\[
y = \pm \frac{7}{2}
\]

\[
y = \frac{7}{2}, y = -\frac{7}{2}
\]

\[
y = \frac{7}{2} \Rightarrow y = \frac{7}{2}, y = -\frac{7}{2}
\]

Two answers!!

\[
\left( \frac{3}{2}, \frac{7}{2} \right), \left( \frac{3}{2}, -\frac{7}{2} \right)
\]

\[
\left( -\frac{3}{2}, \frac{7}{2} \right), \left( -\frac{3}{2}, -\frac{7}{2} \right)
\]
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\[y = [\text{ALPHA}]^2 \]