Using the Graphing Calculator to Solve Equations
(Intersection Technique)

Solve the equation: \( x^2 + 2x - 3 = 4x + 5 \)

Method 1: Using the Intersection of 2 Graphs

Press \( Y= \) on your graphing calculator to enter your functions
Let \( Y_1 = x^2 + 2x - 3 \), the left side of the equation
Let \( Y_2 = 4x + 5 \), the right side of the equation

Press \( \text{WINDOW} \) on your graphing calculator to set the graphing window
Let \( X_{\text{min}} = -8 \), \( X_{\text{max}} = 8 \), \( X_{\text{scl}} = 1 \), \( Y_{\text{min}} = -8 \), \( Y_{\text{max}} = 25 \), \( Y_{\text{scl}} = 1 \), \( X_{\text{res}} = 1 \)

Press \( \text{GRAPH} \) on your graphing calculator to graph the 2 functions
Your graph should look similar to the graph below

Now find the point(s) of intersection

Press \( \text{2nd} \ \text{CALC} \) \text{Intersect} and find the 1\textsuperscript{st} point of intersection of the 2 graphs
\( x = -2 \) \quad \Rightarrow \text{point of intersection} \quad (2, 3) \quad \Rightarrow \text{root of the equation} \quad x = -2 \)

Press \( \text{2nd} \ \text{CALC} \) \text{Intersect} again and find the 2\textsuperscript{nd} point of intersection of the 2 graphs
\( x = 4 \) \quad \Rightarrow \text{point of intersection} \quad (4, 21) \quad \Rightarrow \text{root of the equation} \quad x = 4 \)

Conclusion: The solution to the equation \( x^2 + 2x - 3 = 4x + 5 \) is \( x = -2 \) or \( x = 4 \)
Using the Graphing Calculator to Solve Equations  
(Intersection / x-intercept Technique)

Solve the equation:  \( x^2 + 2x - 3 = 4x + 5 \)

Method 2     Using the x-intercept(s) of a Graph

First, you must set one side of the equation equal to zero

\[
\begin{align*}
x^2 + 2x - 3 &= 4x + 5 \\
-4x - 5 &= 4x - 5 \\
x^2 - 2x - 8 &= 0
\end{align*}
\]

is the resulting equivalent equation.

Press \[ \text{Y=} \] on your graphing calculator to enter your function

Let \( Y_1 = x^2 - 2x - 8 \), the left side of the equation

Let \( Y_2 = 0 \), the right side of the equation

Press \[ \text{WINDOW} \] on your graphing calculator to set the graphing window

Let \( \text{Xmin} = -8 \), \( \text{Xmax} = 8 \), \( \text{Xscl} = 1 \), \( \text{Ymin} = -15 \), \( \text{Ymax} = 25 \), \( \text{Yscl} = 1 \), \( \text{Xres} = 1 \)

Press \[ \text{GRAPH} \] on your graphing calculator to graph the function

Your graph should look similar to the graph below

\[ \text{Graph Image} \]

Now find the x-intercept(s) of the graph; the intersection of the graphs.

Press \[ 2^{nd} \text{ CALC} \] \textbf{Intersect} and find the 1\textsuperscript{st} point of intersection of the 2 graphs

\[
x = -2 \quad y = 0 \quad \Rightarrow \text{(-2,0) is a point of intersection of the 2 graphs} \\
\Rightarrow \quad x = -2 \text{ is a root of the equation}
\]

Press \[ 2^{nd} \text{ CALC} \] \textbf{Intersect} again and find the 2\textsuperscript{nd} point of intersection of the 2 graphs

\[
x = 4 \quad y = 0 \quad \Rightarrow \text{(4,0) is a point of intersection of the 2 graphs} \\
\Rightarrow \quad x = 4 \text{ is a root of the equation}
\]

Conclusion: The solution to the equation \( x^2 + 2x - 3 = 4x + 5 \) is \( x = -2 \) or \( x = 4 \)
Using the Graphing Calculator to Solve Equations
(Zero Technique)

Solve the equation: \( x^2 + 2x - 3 = 4x + 5 \)

Method 3  Using the x-intercept(s) of a Graph

First, you must set one side of the equation equal to zero

\[
\begin{align*}
  x^2 + 2x - 3 &= 4x + 5 \\
  -4x - 5 &= -4x - 5 \\
  x^2 - 2x - 8 &= 0
\end{align*}
\]

is the resulting equivalent equation.

Press \( Y= \) on your graphing calculator to enter your function

Let \( Y1 = x^2 - 2x - 8 \), the left side of the equation

Press \( \text{WINDOW} \) on your graphing calculator to set the graphing window

Let \( \text{Xmin} = -8 \), \( \text{Xmax} = 8 \), \( \text{Xscl} = 1 \), \( \text{Ymin} = -15 \), \( \text{Ymax} = 25 \), \( \text{Yscl} = 1 \), \( \text{Xres} = 1 \)

Press \( \text{GRAPH} \) on your graphing calculator to graph the function

Your graph should look similar to the graph below

Now find the x-intercept(s) of the graph, which are the (real) zero(s) of the function

Press \( \text{2nd CALC} \) zero to find the 1\(^{st}\) x-intercept of the graph

\[
\begin{align*}
  x &= -2 \\
  y &= 0 \Rightarrow x = -2 \text{ is an x-intercept of the graph} \\
  \Rightarrow x &= -2 \text{ is a root of the equation}
\end{align*}
\]

Press \( \text{2nd CALC} \) zero again to find the 2\(^{nd}\) x-intercept of the graph

\[
\begin{align*}
  x &= 4 \\
  y &= 0 \Rightarrow x = 4 \text{ is an x-intercept of the graph} \\
  \Rightarrow x &= 4 \text{ is a root of the equation}
\end{align*}
\]

Conclusion: The solution to the equation \( x^2 + 2x - 3 = 4x + 5 \) is \( x = -2 \) or \( x = 4 \)