Chapter 2, Sections 2-5 Linear Equations and Functions

I. Solving Linear Equations

Solve algebraically. Check #1 and 2 on your calculator by graphing.

\[ \begin{align*}
\text{a)} & \quad \frac{1}{3}x + 3 = 2 \\
& \quad \frac{1}{3}x = -1 \\
& \quad x = -3 \\
\text{b)} & \quad -\frac{1}{2}x + 1 = 3x \\
& \quad 2x = -1 \\
& \quad x = -\frac{1}{2}
\end{align*} \]

\[ \begin{align*}
\text{c)} & \quad 5x - 2(x - 5) = 7x - 3 \\
& \quad 5x - 2x + 10 = 7x - 3 \\
& \quad 3x + 10 = 7x - 3 \\
& \quad -3x = -13 \\
& \quad x = 4.3 \\
\text{d)} & \quad 2(x + 7) = 7x + 2x + 7 \\
& \quad 2x + 14 = 9x + 7 \\
& \quad 7x = 7 \\
& \quad x = 1
\end{align*} \]

\[ \begin{align*}
\text{e)} & \quad 3x - 5 = 3(x - 2) + 4 \\
& \quad 3x - 5 = 3x - 1 + 4 \\
& \quad 3x - 5 = 3x + 1 \\
& \quad 3x = 6 \\
& \quad x = 2
\end{align*} \]

II. Formulas

Solve for the indicated variable.

a) The formula that relates distance, rate, and time is \( D = RT \). Solve for \( R \).

\[ \frac{D}{T} = R \]

b) The formula for the area of a circle is \( A = \pi r^2 \). Solve for \( \pi \).

\[ \pi = \frac{A}{r^2} \]

c) The formula for the circumference of a circle is \( C = \pi d \). Solve for \( d \).

\[ d = \frac{C}{\pi} \]

d) \( I = Prt \), for \( t \)

\[ t = \frac{I}{Pr} \]

e) \( A = P + Prt \), for \( P \)

\[ P = \frac{A}{1 + rt} \]
III. Linear Functions
So far, we've looked at functions in general, domain, range, VLT, functional notation, and solving linear equations. Now, we'll look specifically at linear functions.
One form of a linear function is \( f(x) = mx + b \).

Ex.: \( f(x) = 3x - 2 \)  
\( f(0) = \)
\( f(x) = \frac{1}{2}x + \sqrt{2} \)  
\( f(0) = \)
\( f(x) = -5x - \pi \)  
\( f(0) = \)

Therefore, \( b \) is called ________
Therefore, \( b \) is called ________

Graph the following equations on your calculator. Use the standard viewing window:
\( y = x + 1 \)
\( y = 4x + 1 \)
\( y = 6x + 1 \)
All have the same \( y \)-intercept! What's different?

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Slope:

\[
\frac{\text{rise}}{\text{run}} = \frac{\Delta y}{\Delta x} = \frac{y_2 - y_1}{x_2 - x_1}
\]

ex.: \( y = 4x + 1 \)

If \( f(x) = mx + b \), \( f(0) \) is said to be in slope-intercept form because ________

Find the slope and \( y \)-intercept for the equation \( 5x - 4y = -8 \).

Write the equation of a line whose slope is \(-\frac{2}{3}\) and \( y \)-intercept is \((0, 4)\).

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IV. Linear Graphs
Graph the following by finding the intercepts.

a.) \( y = 3x + 6 \)

b.) \( y = -2x + 5 \)

c.) \( y = 4 \)

d.) \( x = 3 \)

This line is ________  This line is ________

This graph is said to be ________  This graph is said to be ________

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Now we'll look at a practical example where the intercepts give information.

**Salvage Value**

Tytime Electric uses the function \( S(t) = -700t + 3500 \) to determine the salvage value \( S(t) \), in dollars, of a photocopier \( t \) years after its purchase.

a) That does \( t \) represent? What does \( S(t) \) or \( S \) represent? What is salvage value?

\[ S(t) = -700t + 3500 \]

b) Graph \( S(t) \) by finding the intercepts.

c) The point ( ) is the \( y \)-or \( S \)-intercept for this graph. Use this point in a sentence explaining what the point means for the company.

d) The point ( ) is the \( x \)-or \( t \)-intercept for the graph. Use this point in a sentence explaining what the point means for the company.

e) \(-700\) is the slope for the graph. What does \(-700\) represent for the company?

f) What is the practical domain of \( S(t) \)?

What can you say about the slope of parallel lines?

What can you say about the slope of perpendicular lines?