Example 1 Write the Equation of a Line Using a Point and the Slope

a) Use slope-point form to write an equation of the line through $(-2, 5)$ with slope -3.

b) Express the equation in slope-intercept form, $y = mx + b$.

c) Graph the linear relation using technology.

a) $y - y_c = m(x - x_c)$

$y - 5 = -3(x - (-2))$

$y - 5 = -3(x + 2)$

b) $y - 5 = -3(x + 2)$

$y - 5 = -3x - 6$

$+5 \quad +5$

$y = -3x - 1$

Example 2 Determine the Equation of a Line Using Two Points

a) Use slope-point form to write an equation of the line through $(3, -4)$ and $(5, -1)$.

b) Sketch a graph of the line.

c) Rewrite the equation in general form, $Ax + By + C = 0$.

$y - y_c = m(x - x_c)$

a) $m = \frac{\Delta y}{\Delta x}$

$= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{-1 - (-4)}{5 - 3}$

$= \frac{3}{2}$

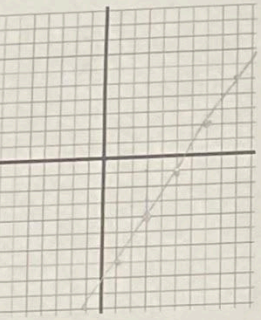
$y - (-4) = \frac{3}{2}(x - 3)$

$y + 4 = \frac{3}{2}(x - 3)$

or

$y - (-1) = \frac{3}{2}(x - 5)$

$y + 1 = \frac{3}{2}(x - 5)$



c) $\left[y + 4 = \frac{3}{2}(x - 3)\right]^2$

$2y + 8 = 3(x - 3)$

$2y + 8 = 3x - 9$

$-8 \quad -8$

$0 = 3x - 2y - 17$

$\left[y + 1 = \frac{3}{2}(x - 5)\right]^2$

$2y + 2 = 3(x - 5)$

$2y + 2 = 3x - 15$

$-2 \quad -2$

$0 = 3x - 2y - 17$

Example 3 Model a Real-Life Situation

Brad Zdanivsky is enthusiastic about mountain climbing. He is a quadriplegic and used custom gear as he climbed the Stawamus Chief in Squamish, BC, on July 31, 2005.

Supposed he moved at a constant rate and climbed the 660-m summit in 11 pitches (sections). Each pitch was approximately 60 m in height. At 5:45 a.m., Brad started his climb 60 m below the top of his first pitch. By 5:55 a.m., he was 40 m below the top of the first pitch. $(0, 60)$ $(10, 40)$

a) Write an equation that describes Brad's distance, d, in metres, below the top of the first pitch in terms of t minutes past 5:45 a.m. Express the equation in $y = mx + b$ form.

b) How long did it take Brad to reach the top of the first pitch?

c) In total, Brad spent 8.5 h changing ropes between pitches. How long did it take Brad to climb the Stawamus Chief?

a) $m = \frac{\Delta y}{\Delta x}$

$= \frac{y_2 - y_1}{x_2 - x_1}$

$= \frac{60 - 40}{0 - 10}$

$= \frac{20}{-10}$

$= -2$

$y - y_c = m(x - x_c)$

$y - 60 = -2(x - 0)$

$y - 60 = -2x$

$+60 \quad +60$

$y = -2x + 60$

$d = -2t + 60$

d = distance

-dy

t = time

-dx

b) $d = -2t + 60$

$0 = -2t + 60$

$-60 \quad -60$

$\frac{-60}{-2} = \frac{-2t}{-2}$

$t = 30$ min

or $\frac{1}{2}$ hr.

$d = 0$, at the pitch top

c) 0.5h per pitch

11 sections

$0.5 \times 11 = 5.5$ hrs

plus 8.5 hrs for ropes

$5.5 + 8.5 = 14$ hrs

It took 14 hrs for him to climb the mountain

7.3 Slope Point form

Format

$y - y_c = m(x - x_c)$

m = slope $\rightarrow \frac{\Delta y}{\Delta x}$

$\rightarrow \frac{y_2 - y_1}{x_2 - x_1}$

$y_c \rightarrow y$ coordinate

$x_c \rightarrow x$ coordinate