**Practice**
**Equations of Lines: Find Equations Given Constraints**

Answer these problems, then check your answers using the key on the next page. If you missed something, look at the solutions after the answer key, and if you still don't understand, watch the review video again.

#1) Write the equation of a line in standard form with $slope = 3$ containing the point $(2, 1)$

#2) Write the equation of a line in standard form with $slope = -\frac{1}{4}$ containing the point $(4, -2)$

#3) Write the equation of a line in standard form with $slope = \frac{9}{2}$ containing the point $(4, 3)$

#4) Write the equation of a line in slope-intercept form containing the point $(8, 9)$ and perpendicular to the line $2y + 9x = -4$

#5) Write the equation of a line in slope-intercept form passing through the point $(5, -2)$ and parallel to the line $2x - 5y = 10$

#6) Write the equation of a line in slope-intercept form containing the point $(10, 4)$ and perpendicular to the line $2x + 5y = 20$

#7) Write the equation of a line in slope-intercept form which passes through the points $(2, 4)$ and $(-1, 7)$

#8) Write the equation of a line in slope-intercept form which contains the points $(3, -2)$ and $(3, 2)$

#9) Write the equation of a line in point-slope form which contains the points $(0, -5)$ and $(4, -2)$

#10) What is the standard form of the equation of a line that has *slope* $= -3$ and contains the point $(2, 5)$

#11) Write the equation of the line that contains the point $(8,0)$ and is parallel to the line $y = \frac{3}{4}x + 1$

**Answers:**

#1) $3x-y=5$

#2) $x+4y=-4$

#3) $9x-2y=30$

#4) $y=\frac{2}{9}x+\frac{65}{9}$

#5) $y=\frac{2}{5}x-4$

#6) $y=\frac{5}{2}x-21$

#7) $y=-x+6$

#8) $x=3$

#9) $(y+5)=\frac{3}{4}x$ *or* $(y+2)=\frac{3}{4}(x-4)$

#10) $3x+y=11$

#11) $y=\frac{3}{4}x-6$

**Solutions:**

#1) Write the equation of a line in standard form with *slope* $= 3$ ($m$) containing the point $(2, 1)$ ($x_0\ y_0$)

$ax + by = c$

but start with point-slope:

$(y - y_0) = m(x - x_0)$

$(y - 1) = 3(x - 2)$

now convert to standard form:

$y - 1 = 3(x - 2)$

$y - 1 = 3x - 6$

$+1 \quad +1$

$y = 3x - 5$

$-3x \quad -3x$

$-3x + y = -5$

$(-3x + y = -5) \cdot -1$

$\boxed{3x - y = 5}$

#2) Write the equation of a line in standard form with *slope* $= -\frac{1}{4}$ ($m$) containing the point $(4, -2)$ ($x_0\ y_0$)

$ax + by = c$

start with point-slope:

$(y - y_0) = m(x - x_0)$

$(y - (-2)) = \left(-\frac{1}{4}\right)(x - 4)$

$y + 2 = -\frac{1}{4}(x - 4)$

convert to standard form:

$\left(y + 2 = -\frac{1}{4}(x - 4)\right) 4$ (to clear fraction)

$4y + 8 = -1(x - 4)$

$4y + 8 = -x + 4$

$-4 \quad -4$

$4y + 4 = -x$

$+x \quad +x$

$x + 4y + 4 = 0$

$-4 \quad -4$

$\boxed{x + 4y = -4}$

#3) Write the equation of a line in standard form with *slope* $= \frac{9}{2}$ ($m$) containing the point $(4, 3)$ ($x_0\ y_0$)

$ax + by = c$

start with point-slope:

$(y - y_0) = m(x - x_0)$

$(y - 3) = \frac{9}{2}(x - 4)$

convert to standard form:

$\left((y - 3) = \frac{9}{2}(x - 4)\right) 2$ multiply by 2 to clear fraction

$2(y - 3) = 9(x - 4)$

$2y - 6 = 9x - 36$

$-2y \quad -2y$

$-6 = 9x - 2y - 36$

$+36 \quad +36$

$30 = 9x - 2y$

$\boxed{9x - 2y = 30}$

#4) Write the equation of a line in slope-intercept form containing the point $(8, 9)$ and perpendicular to the line $2y + 9x = -4$

given line:

$2y + 9x = -4$

$-9x \quad -9x$

$\frac{2y}{2} = \frac{-9x}{2} - \frac{4}{2}$

$y = -\frac{9}{2}x - 2$

slope $= -\frac{9}{2}$

for perpendicular,

new line slope $= \frac{2}{9}$

new line:

$y = mx + b$

$y = \frac{2}{9}x + b$ → $\boxed{y = \frac{2}{9}x + \frac{65}{9}}$

to find b, plug in point $(8,9)$ for x & y

$(9) = \frac{2}{9}(8) + b$

$\left(9 = \frac{16}{9} + b\right) 9$ multiply by 9 to clear fractions

$81 = 16 + 9b$

$-16 \quad -16$

$\frac{65}{9} = \frac{9b}{9}$

$\frac{65}{9} = b$

#5) Write the equation of a line in slope-intercept form passing through the point $(5, -2)$ and parallel to the line $2x - 5y = 10$

given line:

$2x - 5y = 10$

$-2x \quad -2x$

$\frac{-5y}{-5} = \frac{-2x}{-5} + \frac{10}{-5}$

$y = \frac{2}{5}x - 2$

slope $= \frac{2}{5}$

for parallel,

new line slope $= \frac{2}{5}$

new line:

$y = mx + b$

$y = \frac{2}{5}x + b$

plug in $(5, -2)$ to find b:

$(-2) = \frac{2}{5}(5) + b$

$-2 = 2 + b$

$-2 \quad -2$

$-4 = b$

$\boxed{y = \frac{2}{5}x - 4}$

#6) Write the equation of a line in slope-intercept form containing the point $(10, 4)$ and perpendicular to the line $2x + 5y = 20$

given line:

$2x + 5y = 20$

$-2x \quad -2x$

$\frac{5y}{5} = \frac{-2x}{5} + \frac{20}{5}$

$y = -\frac{2}{5}x + 4$

for perpendicular,

new line slope $= \frac{5}{2}$

new line:

$y = mx + b$

$y = \frac{5}{2}x + b$

plug in $(10, 4)$ to find b:

$(4) = \frac{5}{2}(10) + b$

$4 = 25 + b$

$-25 \quad -25$

$-21 = b$

$\boxed{y = \frac{5}{2}x - 21}$

#7) Write the equation of a line in slope-intercept form which passes through the points $(2, 4)$ and $(-1, 7)$

$x_1, y_1$ $x_2, y_2$

$y = mx + b$

need slope, use slope formula!

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

$m = \frac{7-4}{-1-2}$

$m = \frac{3}{-3}$

$m = -1$

$y = -1x + b$

$y = -x + b$

to find b, pick either point and plug in for x & y:

$(4) = -(2) + b$

$4 = -2 + b$

$+2 \quad +2$

$6 = b$

$y = -x + 6$

#8) Write the equation of a line in slope-intercept form which contains the points $(3, -2)$ and $(3, 2)$

$x_1, y_1$ $x_2, y_2$

$y = mx + b$

need slope, use slope formula!

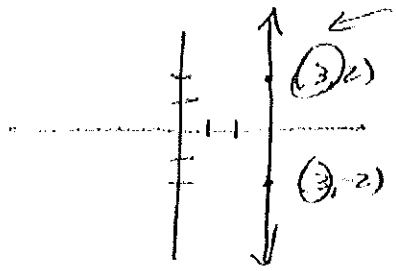
$m = \frac{y_2 - y_1}{x_2 - x_1}$

$m = \frac{2-(-2)}{3-3}$

$m = \frac{4}{0}$

undefined

~~x~~ this must be a vertical line graph to see




vertical line, so equation is

$x = 3$

#9) Write the equation of a line in point-slope form which contains the points $(0, -5)$ and $(4, -2)$

$x_1, y_1$ $x_2, y_2$

$(y - y_1) = m(x - x_1)$

use slope formula first

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

$m = \frac{-2-(-5)}{4-0}$

$m = \frac{3}{4}$

$(y - y_1) = \frac{3}{4}(x - x_1)$

for $x_1, y_1$ use either given point:

$(y - (-5)) = \frac{3}{4}(x - 0)$ or $(y - (-2)) = \frac{3}{4}(x - 4)$

$(y + 5) = \frac{3}{4}x$ or $(y + 2) = \frac{3}{4}(x - 4)$

#10) What is the standard form of the equation of a line that has *slope* = −3 and contains the point (2, 5)

$m$ $x_0$ $y_0$

$ax+by=c$

use point-slope 1st:

$(y-y_0)=m(x-x_0)$

$(y-y_0)=-3(x-x_0)$

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

now convert to standard form:

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

$y-5=-3x+6$

$+3y \quad +3x$

$3x+y-5=6$

$+5 \quad +5$

$\boxed{3x+y=11}$

#11) Write the equation of the line that contains the point (8,0) and is parallel to the line $y=\frac{3}{4}x+1$

doesn't specify form so we can use any.

Choosing to use slope-intercept.

given line:

$y=\frac{3}{4}x+1$

slope $=\frac{3}{4}$

need parallel,

so new line slope $=\frac{3}{4}$

new line:

$y=mx+b$

$y=\frac{3}{4}x+b$

plug in $(8,0)$ to obtain $b$:

$(0)=\frac{3}{4}(8)+b$

$0=6+b$

$-6 \quad -6$

$-6=b$

$\boxed{y=\frac{3}{4}x-6}$