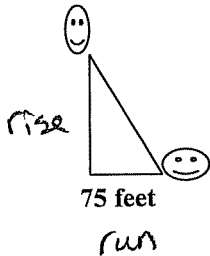1.) The slope of a hill is 3/2. If the horizontal distance from Bert to Ernie is 75 feet, what is the vertical distance between them?

rise

75 feet

run

$slope = \dfrac{rise}{run}$

$\dfrac{3}{2} = \dfrac{rise}{75}$

$75 \times \dfrac{3}{2} = \dfrac{rise}{75} \times 75$

$rise = \dfrac{3}{2} \times \dfrac{75}{1}$

$= \dfrac{225}{2}$

$rise = 112.5$

Vertical distance
$= 112.5$ feet

2.) Given the line segment A(1,4) to B(k,-2). Find the value of k if the slope of AB is -2

$\overset{x_1\,y_1}{A(1,4)}$ $\overset{x_2\,y_2}{B(k,-2)}$

$slope = \dfrac{y_2 - y_1}{x_2 - x_1}$

$\dfrac{-2}{1} = \dfrac{-2 - 4}{k - 1}$

$\dfrac{-2}{1} = \dfrac{-6}{k-1}$

cross mult

$-2(k-1) = 1(-6)$

$-2k + 2 = -6$

$-2k + 2 = -6$
$\quad\; -2 \quad\;\; -2$

$-2k = -8$

$\dfrac{-2k}{-2} = \dfrac{-8}{-2}$

$k = 4$

3.) If these two lines are parallel, determine the value of k:

$kx - 8y - 8 = 0$

$x - 2y + 1 = 0$

Rearrange to slope-intercept form

$kx - 8y - 8 = 0$
$\quad\;\; +8y \qquad +8y$

$kx - 8 = 8y$

$\dfrac{kx}{8} - \dfrac{8}{8} = \dfrac{8y}{8}$

$y = \dfrac{k}{8}x - 1$

$x - 2y + 1 = 0$
$\quad\; +2y \qquad +2y$

$x + 1 = 2y$

$\dfrac{x}{2} + \dfrac{1}{2} = \dfrac{2y}{2}$

$y = \dfrac{x}{2} + \dfrac{1}{2}$

Lines are parallel
so they have equal
slopes

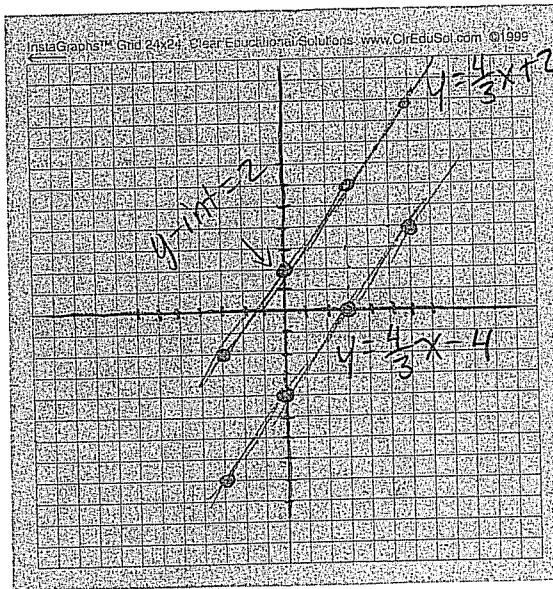$\dfrac{k}{8} = \dfrac{1}{2}$ cross multiply

$2k = 8(1)$

$k = \dfrac{8}{2}$

$k = 4$

4. The equation of a line is $4x - 3y - 12 = 0$
   Determine the equation of a parallel line that intersects the y-axis 6 units above the given line. State the equation in slope-intercept form, point-slope form, and general form.

$$4x - 3y - 12 = 0$$
$$+3y \qquad +3y$$
$$4x - 12 = 3y$$
$$3y = 4x - 12$$
$$\frac{3y}{3} = \frac{4x}{3} - \frac{12}{3}$$
$$y = \frac{4}{3}x - 4$$

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

Intersect y-axis
6 units above
so 6 units above y-int of -4
$$-4 + 6 = 2$$
So y-int of new line $= 2$ & slope $= \frac{4}{3}$

Slope - intercept form
$$y = \frac{4}{3}x + 2$$

General Form:
$$3y = 3\left(\frac{4}{3}x\right) + 3(2)$$
$$3y = 4x + 6$$
$$-3y \qquad -3y$$
$$4x - 3y + 6 = 0$$

Point slope form
Pick point $(3, 6)$
$$y - y_1 = m(x - x_1)$$
$$y - 6 = \frac{4}{3}(x - 3)$$

5. Find the equation of the line that passes through the points (3, -1) and (10, -4). State the equation in slope-intercept form, point-slope form, and general form.

slope $= \dfrac{y_2 - y_1}{x_2 - x_1}$
$$= \frac{-4 - -1}{10 - 3}$$
$$= \frac{-3}{7}$$

Point-Slope Form
Pick point $(3, -1)$
$$y - y_1 = m(x - x_1)$$
$$y - (-1) = \frac{-3}{7}(x - 3)$$
$$y + 1 = \frac{-3}{7}(x - 3)$$

Slope - intercept
$$y + 1 = \frac{-3}{7}(x - 3)$$
$$7(y + 1) = 7\left(\frac{-3}{7}(x - 3)\right)$$
$$7(y + 1) = -3(x - 3)$$
$$7y + 7 = -3x + 9$$
$$-7 \qquad\quad -7$$
$$7y = -3x + 2$$
$$\frac{7y}{7} = \frac{-3x}{7} + \frac{2}{7}$$
$$y = \frac{-3}{7}x + \frac{2}{7}$$

General form
$$y + 1 = \frac{-3}{7}(x - 3)$$
$$7(y + 1) = 7\left(\frac{-3}{7}(x - 3)\right)$$
$$7(y + 1) = -3(x - 3)$$
$$7y + 7 = -3x + 9$$
$$+3x \qquad\quad + 3x$$
$$3x + 7y + 7 = 9$$
$$-9 \quad -9$$
$$3x + 7y - 2 = 0$$

6. Determine the equation of a line with the same x-intercept as $9x - 2y + 18 = 0$ and passes through point (4,-5). State the equation in slope-intercept form, point-slope form, and general form.

Same x-int as $9x - 2y + 18 = 0$
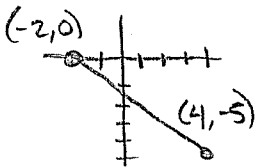
x-int: $y = 0$
$9x - 2(0) + 18 = 0$
$9x + 18 = 0$
$9x = -18$
$x = \frac{-18}{9}$
$x = -2$
$(-2, 0)$

slope = $\frac{rise}{run}$
$= -\frac{5}{6}$

Point-Slope
choose point: (-2,0)
$y - y_1 = m(x - x_1)$
$y - 0 = \frac{-5}{6}(x - (-2))$
$y = \frac{-5}{6}(x + 2)$

Slope - Intercept
$y = \frac{-5}{6}(x + 2)$
$y = \frac{-5}{6}x - \frac{5}{6}\left(\frac{2}{1}\right)$
$y = \frac{-5}{6}x - \frac{10}{6}$
$y = \frac{-5}{6}x - \frac{5}{3}$

General Form
$y = \frac{-5}{6}(x + 2)$
$6y = 6\left(\frac{-5}{6}(x + 2)\right)$
$6y = -5(x + 2)$
$6y = -5x - 10$
$+5x \qquad +5x$
$5x + 6y = -10$
$+10 \qquad +10$
$5x + 6y + 10 = 0$

7. The equation of a line is $Ax + 4y + C = 0$. The slope is $-\frac{3}{2}$ and the y-intercept is 4. What are the values of A and C?

$Ax + 4y + C = 0$
$-Ax \qquad\qquad -Ax$
$4y + C = -Ax$
$\quad -C \qquad\qquad -C$
$4y = -Ax - C$
$\frac{4y}{4} = \frac{-A}{4}x - \frac{C}{4}$
$y = -\frac{A}{4}x - \frac{C}{4}$

Rearrange to $y = mx + b$

Slope $= \frac{-3}{2} = \frac{-A}{4}$
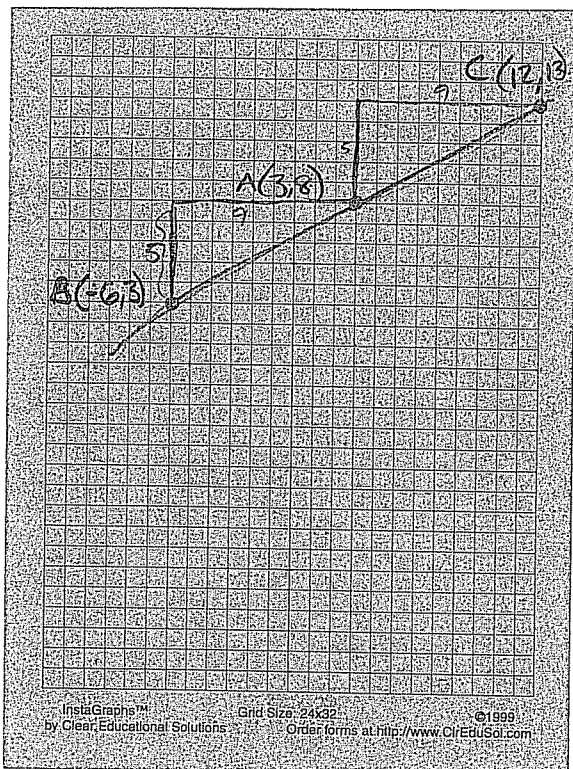$\frac{-3 \times 2}{2 \times 2} = \frac{-6}{4} = \frac{-A}{4}$
$\therefore A = 6$

y-intercept $= 4$
$\frac{-C}{4} = \frac{4}{1}$
$\frac{4 \times 4}{1 \times 4} = \frac{-16}{-4} = -\frac{C}{4}$
$C = -16$

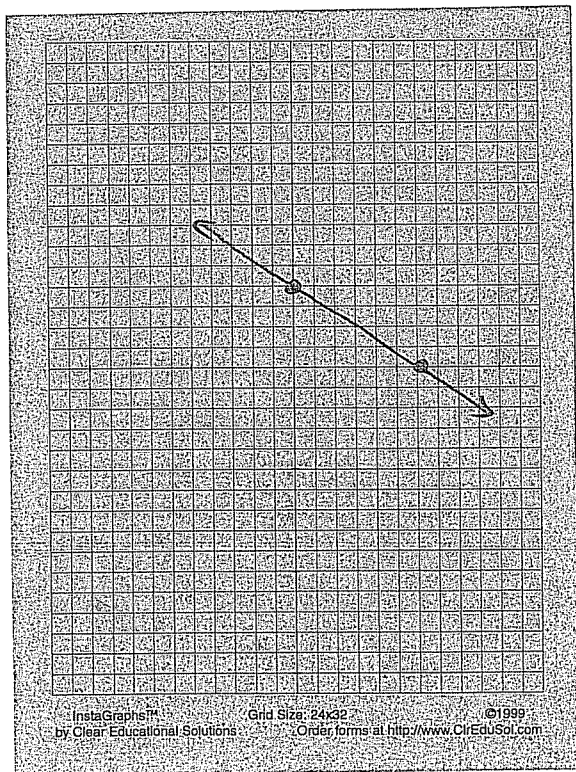8. Points A(3, 8), B(-6, 3), and C (12, k) lie on the same line. What is the value of k?

Use Slope to draw line

$C(12,13)$

$K = 13$

9. Determine the equation of a line with x-intercept 6 and y-intercept -4 in standard form.

$$m = \frac{rise}{run}$$

$$= -\frac{4}{6}$$

$$= -\frac{2}{3}$$

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

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

$$3y = -2x + 12$$

$$2x + 3y - 12 = 0.$$