Problem

The regression line of y on x is $3x + 4y + 8 = 0$, and the regression line of x on y is $4x + 3y + 7 = 0$. What is the value of the Pearson correlation coefficient?

Solution

Rewriting both equations:

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

$$x = -\frac{7}{4} - \frac{3}{4} * y$$

$b_1 = b_2 = -\frac{3}{4}$

$$p = b_1 \frac{\sigma_x}{\sigma_y}$$

$$p = b_2 \frac{\sigma_y}{\sigma_x}$$

$$p^2 = b_1 \cdot b_2$$

$$p = \sqrt{b_1 b_2} = \frac{3}{4} \vee -\frac{3}{4}$$

Both x and y equations have negative slopes, so corelation must also be negative.