## Answer on Question #69436 – Math – Other

### Question

A person standing at the crossing at two straight paths represented by the equations 2x-3y-4 = 0 and 3x-4y-5 = 0, wants to reach a path represented by 6x-7y+8 = 0 in least time. Find the equations of path he should follow.

### Solution

First, let's find where the person is standing. This is an intersection of two lines, which can be found by solving the system of equations representing these lines:

$$\begin{cases}2x-3y-4=0\\3x-4y-5=0\end{cases}\rightarrow\begin{cases}x=\frac{1}{2}(3y+4)\\3x-4y-5=0\end{cases}\rightarrow\begin{cases}x=\frac{1}{2}(3y+4)\\\frac{3}{2}(3y+4)-4y-5=0\end{cases}\rightarrow\begin{cases}x=\frac{1}{2}(3y+4)\\\frac{9}{2}y+6-4y-5=0\end{cases}$$

$$\rightarrow\begin{cases}x=\frac{1}{2}(3y+4)\\\frac{1}{2}y+1=0\end{cases}\rightarrow\begin{cases}x=\frac{1}{2}(3y+4)\\y=-2\end{cases}\rightarrow\begin{cases}x=\frac{1}{2}(3(-2)+4)\\y=-2\end{cases}\rightarrow\begin{cases}x=-1\\y=-2\end{cases}$$

The person is initially standing at $(x_0, y_0) = (-1, -2)$.

The shortest path to new 3rd path is perpendicular to it. For a line represented in form $ax + by + c = 0$ the perpendicular must follow the following form $-by + ax + d = 0$. 3rd path is represented by $6x - 7y + 8 = 0$, so perpendicular to it is $7x + 6y + d = 0$ for some unknown $d$. To find $d$ let's substitute initial place into equation – this path must contain it:

$$7x_0 + 6y_0 + d = 0 \rightarrow 7(-1) + 6(-2) + d = 0 \rightarrow -19 + d = 0 \rightarrow d = 19.$$

The person must follow the path represented by $7x + 6y + 19 = 0$.

**Answer:** $7x + 6y + 19 = 0$.