

The block will begin to slide when any of the following is true:

1)  $F_x > \mu_x N$

2)  $F_y > \mu_y N$

3)  $F > \mu N$

The 3<sup>rd</sup> one can be re-worked by substituting as follows:

$$F = \sqrt{F_x^2 + F_y^2}$$

$$\mu = \mu_x + \theta / (\pi/2) (\mu_y - \mu_x)$$

$$\theta = \text{atan2}(F_y, F_x)$$

... to get an inequality with only one unknown ( $F_x$ ):

$$\sqrt{F_x^2 + F_y^2} > [\mu_x + (\mu_y - \mu_x) \cdot \text{atan2}(F_y, F_x) / (\pi/2)] \cdot N$$

... which can be solved numerically or graphically for  $F_x$ .