10.1 Lines

lines in form

\[ y = mx \]

the **inclination** describes steepness of line

angle line make w/ positive x-axis

\[ m = \tan \theta \]

slope inclination
Find the inclination of $2x + 3y = 6$

$3y = -2x + 6$

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

$m = \tan \theta$

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

$180^\circ + 33.7^\circ = \theta$

$146.3^\circ = \theta$
Find the angle between 2 lines

\[ \theta = 180^\circ - \theta_1 - (180^\circ - \theta_2) \]

\[ \theta = \theta_2 - \theta_1 \]

w/ slopes

\[ \tan \theta = \tan(\theta_2 - \theta_1) \]

\[ = \frac{\tan \theta_2 - \tan \theta_1}{1 + \tan \theta_2 \tan \theta_1} \]

\[ \tan \theta = \frac{M_2 - M_1}{1 + M_1 M_2} \]
Find the angle between

\[2x + y = 4 \quad \text{and} \quad x - y = 2\]

\[\begin{align*}
y &= -2x + 4 \\
m &= -2
\end{align*}\]

\[\begin{align*}
y &= x - 2 \\
m &= 1
\end{align*}\]

\[\tan \theta = \left| \frac{m_2 - m_1}{1 + m_1 m_2} \right|\]

\[\begin{align*}
\tan \theta &= \left| \frac{1 - (-2)}{1 + (1)(-2)} \right| \\
\tan \theta &= \left| \frac{3}{-1} \right| \\
\tan \theta &= 3
\end{align*}\]

\[\theta = \tan^{-1} 3\]

\[\theta = 71.6^\circ\]
Distance from Point to Line

\[ Ax + By + C = 0 \]

\[ d = \frac{|Ax_1 + By_1 + C|}{\sqrt{A^2 + B^2}} \]

Find the distance from \((0, 2)\) to \(4x + 3y + 0 = 0\).

\[ d = \frac{|4(0) + 3(2) + 0|}{\sqrt{4^2 + 3^2}} \]

\[ d = \frac{6}{5} \]