**8.5 Applications of Determinants**

**Area of a Triangle**

 A triangle with vertices $\left(x\_{1}, y\_{1}\right)$, $\left(x\_{2}, y\_{2}\right)$ and $\left(x\_{3}, y\_{3}\right)$ has area = $\pm \frac{1}{2} \left| \begin{matrix}x\_{1}&y\_{1}&1\\x\_{2}&y\_{2}&1\\x\_{3}&y\_{3}&1\end{matrix} \right|$

 (use ± to ensure that the area is a positive number)

Ex: Find the area of a triangle whose vertices are $\left(0, 0\right)$, $\left(4, 1\right)$ and $\left(2, 5\right)$.

 Area = $\pm \frac{1}{2} \left| \begin{matrix}0&0&1\\4&1&1\\2&5&1\end{matrix} \right|$

**Test for Collinear Points**

 Three points $\left(x\_{1}, y\_{1}\right)$, $\left(x\_{2}, y\_{2}\right)$ and $\left(x\_{3}, y\_{3}\right)$ are collinear if and only if $ \left| \begin{matrix}x\_{1}&y\_{1}&1\\x\_{2}&y\_{2}&1\\x\_{3}&y\_{3}&1\end{matrix} \right|=0$

Ex: Determine whether the points $\left(3, -1\right)$, $\left(0, -3\right)$ and $\left(9, 3\right)$ are collinear.

 $ \left|\begin{matrix}3&-1&1\\0&-3&1\\9& 3&1\end{matrix} \right|=$

**Two-Point form of the Equation of a Line**

 The equation for a line through the points $\left(x\_{1}, y\_{1}\right)$ and $\left(x\_{2}, y\_{2}\right)$ is: $\left| \begin{matrix}x&y&1\\x\_{1}&y\_{1}&1\\x\_{2}&y\_{2}&1\end{matrix} \right|=0$

Ex: Find an equation of the line through $\left(0, 0\right)$ and $\left(4, -5\right)$.

 $\left| \begin{matrix}x& y& 1\\0& 0& 1\\4&-5& 1\end{matrix} \right|=0$

Expand using Row 1: