

1 Colinear points

Given three points, check whether the three points are colinear or not $p_0(x_0, y_0), p_1(x_1, y_1), p_2(x_2, y_2)$

1. find the equation of two points
2. substitute the third point to the equation and check whether it is zero or not
3. if $f(x, y) = 0$, it is colinear
4. if $f(x, y) > 0$, it is on one side
5. if $f(x, y) < 0$, it is on other side

$$\begin{aligned}\frac{y - y_0}{x - x_0} &= \frac{y_1 - y_0}{x_1 - x_0} \\ (y - y_0)(x_1 - x_0) &= (x - x_0)(y_1 - y_0) \\ f(x, y) &= (y - y_0)(x_1 - x_0) - (x - x_0)(y_1 - y_0)\end{aligned}\tag{1}$$

There is one big problem with the solution. The line can not be vertical line since $x_1 - x_0$ can NOT be zero