

# 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

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

(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