



$(c, d)$ ; thus,  $b/a = d/c$ , or  $ad = bc$ . If  $(a, b)$  and  $(c, d)$  lie on the same vertical line through the origin, then the points must have the form  $(0, b)$  and  $(0, d)$ , and again it must happen that  $ad = bc$ . Therefore,  $(a, b)R(c, d)$  means that  $ad = bc$ . This equation can be used to verify that  $R$  is reflexive, symmetric, and transitive.

(b) Each equivalence class is the set of points of  $A$  on a line of the form  $y = mx$  or the vertical line  $x = 0$ .

(c) If  $A$  is replaced by the entire plane,  $R$  is not an equivalence relation. It fails to satisfy the transitive property; for example,  $(1, 2)R(0, 0)$  and  $(0, 0)R(2, 2)$ , but  $(1, 2) \not R(2, 2)$  because the line passing through  $(1, 2)$  and  $(2, 2)$  does not pass through the origin.

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