1. Based on Kuratowski's definition of ordered pairs, prove that:

$$(a, b) = (c, d) \iff (a = b \wedge c = d)$$

According to Kuratowski's definition, $(x, y) = x, x, y$.

If $(a, b) = (c, d)$, then $a, a, b = c, c, d$

1. if $a = b$, then $a, a, b = a, a, a = a = c, c, d$, then $c = c, d = a$, then $a = c = d$, then $b = a = d$ then $a = c, b = d$

2. if $a \neq b$ a. if $a = c, d$, then $a = c = d$, $c, c, d = a$, then $a, a, b = a$, then $a = b$, which contradicts $a \neq b$. b. the same goes for $c = a, b$ c. if $a = c$, then $a = c$, then $a, a, b = c, c, d = a, a, d$, then $a, b = a, d$, then $b = d$.