Prove or disprove the following conjecture.

Conjecture C. For all nonzero integers a, b, and c, $\gcd(a, bc) = 1$ if and only if $\gcd(a, b) = 1$ and $\gcd(a, c) = 1$.

Theorem D. Let a and x be integers with $x > 0$. Prove that $\gcd(a, a + x) = \gcd(a, x)$.

Proof. $\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\qquad\quad$ $\square$