▶ **Problem 4.4-10** Given integer a, b, c, d, x and a prime p, suppose $(ax+b)(cx+d) \equiv 0 \pmod{p}$. Prove that $ax + b \equiv 0 \pmod{p}$ or $cx + d \equiv 0 \pmod{p}$.

Proof. $(ax + b)(cx + d) \equiv 0 \pmod{p}$ implies $P|(ax + b)(cx + d)$. Since p is prime, by Proposition 4.3.7, we conclude that $p|(ax + b)$ or $p|(cx + d)$. The first case says that $ax + b \equiv 0 \pmod{p}$ and the second that $cx + d \equiv 0 \pmod{p}$, given the desired result. □