Section 5.1

5.2 Disprove the statement: If \( n \in \{0, 1, 2, 3, 4\} \), then \( 2^n + 3^n + n(n-1)(n-2) \) is prime.

5.4 Disprove the statement: Let \( n \in \mathbb{N} \). If \( \frac{n(n+1)}{2} \) is odd, then \( \frac{(n+1)(n+2)}{2} \) is odd.

5.6 Let \( a, b \in \mathbb{Z} \). Disprove the statement: If \( ab \) and \( (a + b)^2 \) are of opposite parity, then \( a^2b^2 \) and \( a + ab + b \) are of opposite parity.

5.8 (a) Prove: For positive real numbers \( a \) and \( b \), \( (a + b)(1/a + 1/b) \geq 4 \).

(b) Does (a) imply that \( (c^2 + d^2)(1/c^2 + 1/d^2) \geq 4^2 \) for every two positive numbers \( c \) and \( d \)?

(c) Does (a) imply that \( (c^2 + d^2)(1/c^2 + 1/d^2) \geq 4 \) for every two positive numbers \( c \) and \( d \)?