[2 × 5 pts.] Label the following statements as True or False. Briefly explain for partial credit.

(a) Every orthonormal set is linearly independent.

(b) If \( \langle x, y \rangle = 0 \) for all \( y \) in an inner product space, then \( x = 0 \).

(c) If \( S \) is an orthogonal set in an inner product space with dimension \( n \), then \( |S| \leq n \).

(d) The following \( \langle f, g \rangle = \int_{-1}^{1} f'(t)g'(t)dt \) is an inner product on \( P_2(\mathbb{R}) \).

(e) For a linear operator on a finite dimensional inner product space \( V \), we have \( (S^*)^* = S \).