

*Proof.* Let  $t, u \in \mathbb{R}$  where  $t = xy$  and  $u = zw$ . So,

$$\begin{aligned} 4xyzw &= 2 \cdot 2tu \\ &\leq 2 \cdot (t^2 + u^2) \\ &= 2 \cdot ((xy)^2 + (zw)^2) && \text{(substituting variables)} \\ &= 2 \cdot (x^2y^2 + z^2w^2) \\ &= 2x^2y^2 + 2z^2w^2 \\ &\leq ((x^2)^2 + (y^2)^2) + ((z^2)^2 + (w^2)^2) \\ &= x^4 + y^4 + z^4 + w^4 \end{aligned} \quad \square$$