**Solution** (#748) Let $A$ be an $m \times n$ matrix and $B$ be an invertible $n \times n$ matrix. Then

$$\begin{aligned}
\operatorname{rank}(AB) &= \operatorname{rank}((AB)^T) && \text{as row rank equals column rank (Corollary 3.127)} \\
&= \operatorname{rank}(B^T A^T) && \text{[by the product rule for transposes]} \\
&= \operatorname{rank}(A^T) && \text{as } B^T \text{ is invertible (transpose rule) and by Proposition 3.88(d)} \\
&= \operatorname{rank}(A) && \text{as row rank equals column rank (Corollary 3.127).}
\end{aligned}$$