Assignment 4
due on Tuesday, Nov 21, 2017

Name:

Exercise 1 (10 points).
Let $X \in K^{m\times m}$, $Y \in K^{m,n}$, $Z \in K^{n\times m}$, and $W \in K^{n\times n}$ with $\det W \neq 0$. Prove that

$$\det \begin{pmatrix} X & Y \\ Z & W \end{pmatrix} = \det(W)\det(X - YW^{-1}Z),$$

Exercise 2 (20 points).
In the proof of Strassen's lower bound for 3-slice tensors, we used the tensor $T_A^{\wedge}$. What happens if we use T_A^S (defined by projecting onto S^2A) instead?

Exercise 3 (10 points).
Generalize Strassen's lower bound: If $T = (I, X, Y)$ is a 3-slice tensor with slices in $K^{b\times b}$, then

$$\underline{R}(T) \geq b + \frac{1}{2}\operatorname{rk}(XY - YX).$$