B15. **MATH 1300: Test #3 (Fall 2012)**

Solution & marking scheme:

[8] 1. Let $A=\begin{bmatrix} 1 & 2 & 3 \\ 2 & 1 & 1 \\ 0 & 1 & 1 \end{bmatrix}$ and let $B=\begin{bmatrix} 1 & -1 & 3 \\ 1 & 0 & 0 \\ 0 & 1 & 1 \end{bmatrix}$ Find

(a) Compute $\det A^{-1}$.

(b) Compute $\det(A+B)$.

Solution. (a) $\det(A)=2$ and so $\det A^{-1}=\frac{1}{2}$.

(b) $A+B=\begin{bmatrix} 2 & 1 & 6 \\ 3 & 1 & 1 \\ 0 & 2 & 2 \end{bmatrix}$ and $\det(A+B)=30$.

[9] 2. Suppose A, B and C are 3×3 matrices such that $\det A=4$, $\det C=5$, and such that $2AB=C$. Find $\det B$.

Solution. $\det(2AB)=\det C$, so $2^3(\det A)(\det B)=\det C$, and so $\det B=\frac{\det C}{8\det A}=\frac{5}{32}$.

[8] 3. Let $\mathbf{u}=(3,0,4)$ and $\mathbf{v}=(1,2,-1)$.

(a) Compute $2\mathbf{u}-3\mathbf{v}$.

(b) Find the coordinates of the unit vector in the direction of **u.**

Solution. (a) $2\mathbf{u}-3\mathbf{v}=(6,0,8)-(3,6,-3)=(3,-6,11)$.

$\|\mathbf{u}\|=\sqrt{3^2+4^2}=5$ and so $\frac{1}{5}(3,0,4)=\left(\frac{3}{5},0,\frac{4}{5}\right)$ is the desired vector.