Math 214 Spring 2007 **SHOW ALL YOUR WORK** Quiz **Eight**

1. Suppose that $\det(A) = \begin{vmatrix} a & b & c \\ d & e & f \\ g & h & i \end{vmatrix} = -3$.

Find the following determinants, and briefly explain your reasoning. Note you do not have to do any calculations, just give the value of the determinant **and** the reason(s) for how you know what the value of each determinant is.

a. (*2 points*). $\begin{vmatrix} g & h & i \\ a & b & c \\ d & e & f \end{vmatrix} =$ $(-1)(-1)(-3) = -3$

$\begin{pmatrix} g & h & i \\ a & b & c \\ d & e & f \end{pmatrix}$ is 2 row swaps from $\begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}$

$R_1 \to R_2$, $R_1 \to R_3$

b. (*2 points*). $\begin{vmatrix} a & d & g \\ b & e & h \\ c & f & i \end{vmatrix} =$ -3

$\begin{pmatrix} a & d & g \\ b & e & h \\ c & f & i \end{pmatrix} = \begin{pmatrix} a & b & c \\ d & e & f \\ g & h & i \end{pmatrix}^T$

$\det(A^T) = \det A$

c. (*2 points*). $\begin{vmatrix} 2a & 2b & 2c \\ 2d & 2e & 2f \\ 2g & 2h & 2i \end{vmatrix} =$ $2^3 \cdot (-3) = -24$

$\det(kA) = k^n \det(A)$ for $n \times n$ matrix A

d. (*2 points*). $\begin{vmatrix} a & b & c \\ 0 & e - bd/a & f - cd/a \\ 0 & h - bg/a & i - cg/a \end{vmatrix} =$ -3

Applying elementary row operations to eliminate A_{21} and A_{31} does not change determinant

e. (*2 points*). $\det\left(\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}\right) =$ $(-3)(-3) = 9$

$\det(A^n) = (\det A)^n$