Math 2568, Quiz #6, Fall 2013 Name KEY

Instructions: Show all work. Use exact values.

1. Explain why, in your own words, why an invertible matrix must not have a zero determinant. Be sure that you are talking about general square matrices and not specifically the 2x2 case only.

an invertible matrix must have a nonzero determinant because it must reduce to the nxn identity matrix which has a determinant of 1. Row operations can multiply the determinant by scalars but not by zero. If the determinant is zero, it won't reduce to the nxn identity.

2. Use the cofactor method to calculate the determinant of the matrix $A = \begin{bmatrix} 6 & 1 & 2 & 3 \\ 0 & -2 & 0 & -4 \\ 4 & 3 & 2 & -1 \\ 0 & 5 & 1 & 1 \end{bmatrix}$.

You may check your answer in the calculator, but you must show work to receive credit.

$$6\begin{vmatrix} -2 & 0 & -4 \\ 3 & 2 & -1 \\ 5 & 1 & 1 \end{vmatrix} + 4\begin{vmatrix} 1 & 2 & 3 \\ -2 & 0 & -4 \\ 5 & 1 & 1 \end{vmatrix} =$$

$$6\left[2\begin{vmatrix} -2 & -4 \\ 5 & 1 \end{vmatrix} - \begin{vmatrix} -2 & -4 \\ 3 & -1 \end{vmatrix}\right] + 4\left[-2\begin{vmatrix} -2 & -4 \\ 5 & 1 \end{vmatrix} - \begin{vmatrix} 1 & 3 \\ -2 & -4 \end{vmatrix}\right]$$

$$6\left[2(-2+20) - (+2+12)\right] + 4\left[-2(-2+20) - (-4+6)\right]$$

$$6\left[2(18) - 14\right] + 4\left[-2(18) - (2)\right] =$$

$$6[36 - 14] + 4[-36-2] = 6[22] + 4[-38] =$$

$$132 - 152 = \boxed{-20}$$