Name ___Solutions_____ Linear Algebra, Quiz 4

1) Find the following:

$$\begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 5 & 6 & 7\end{bmatrix}\begin{bmatrix}2 & \pi\\ 0 & 0\\ 1 & 3\end{bmatrix}$$

$$\begin{bmatrix}1 & 0 & 0\\ 0 & 2 & 0\\ 5 & 6 & 7\end{bmatrix}\begin{bmatrix}2 & \pi\\ 0 & 0\\ 1 & 3\end{bmatrix} = \begin{bmatrix}2 & \pi\\ 0 & 0\\ 5\cdot 2+7 & 5\cdot\pi+7\cdot 3\end{bmatrix} = \begin{bmatrix}2 & \pi\\ 0 & 0\\ 17 & 21+5\pi\end{bmatrix}$$

2) Find the following:

$$\begin{vmatrix}1 & 0 & 0 & 0\\ 0 & 2 & 0 & 627\\ \pi & 16 & 1 & 1\\ 2\pi & 32 & 2 & 3\end{vmatrix}$$

$$\begin{aligned}\begin{vmatrix}1 & 0 & 0 & 0\\ 0 & 2 & 0 & 627\\ \pi & 16 & 1 & 1\\ 2\pi & 32 & 2 & 3\end{vmatrix} &= 1\cdot\begin{vmatrix}2 & 0 & 627\\ 16 & 1 & 1\\ 32 & 2 & 3\end{vmatrix} + 0 + 0 + 0\\ &= 2\cdot\begin{vmatrix}1 & 1\\ 2 & 3\end{vmatrix} + 0 + 627\cdot\begin{vmatrix}16 & 1\\ 32 & 2\end{vmatrix}\\ &= 2\cdot(3-2) + 627\cdot 0\\ &= 2\end{aligned}$$

3) For what values of x is the matrix below NOT invertible?

$$\begin{bmatrix}-x & 2\\ 1 & 1-x\end{bmatrix}$$

Taking the determinant we get: $\begin{vmatrix}-x & 2\\ 1 & 1-x\end{vmatrix} = -x\cdot(1-x) - 2 = x^2 - x - 2 = (x-2)(x+1)$

The matrix is invertible if and only if the determinant is not zero. Hence it is not invertible if and only if the determinant is zero. This occurs when $x = 2$ or $x = -1$.