MATH 105A and 110A Review: The determinant and invertibility of the Jacobian

Facts to Know:

The determinant of a 2×2 matrix is

$$\begin{vmatrix} a & b \\ c & d \end{vmatrix} =$$

The determinant of a 3×3 matrix is

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

Any $n \times n$ matrix A is said to be **invertible** if there exists a matrix B such that

Any $n \times n$ matrix A is invertible if and only if

The inverse of a 2×2 matrix is

$$\begin{bmatrix} a & b \\ c & d \end{bmatrix}^{-1} =$$

To find the inverse of A, consider the augmented matrix $[A|I]$ and row reduce it to reduced echelon form:

Examples:

1. Find the inverse of the Jacobian matrix of $F(x, y) = (xy^2, 2xy)$ when possible.

2. Find the inverse of the Jacobian matrix of $F(x, y, z) = (xyz, 2yz, 3z)$ at the point $(1, 1, 1)$ if possible.