

Name:  
Student ID:

Tuesday section time:

**Math 20F - Linear Algebra - Winter 2003**

**Quiz #3 — January 28**

(Do not discuss quiz with students who haven't taken it yet – until 8:00pm.)

1. What are the determinants of the following three matrices?

$$A = \begin{pmatrix} 1 & 0 & 2 & 3 \\ 0 & 4 & 5 & 0 \\ 0 & 0 & 0 & 1 \\ 0 & 0 & 2 & 3 \end{pmatrix}$$

$$\text{ANSWER: } \det(A) = - \begin{vmatrix} 1 & 0 & 2 & 3 \\ 0 & 4 & 5 & 0 \\ 0 & 0 & 2 & 3 \\ 0 & 0 & 0 & 1 \end{vmatrix} = -1 \cdot 4 \cdot 2 \cdot 1 = -8.$$

$$B = \begin{pmatrix} 1 & 1 & 2 & 2 \\ -1 & -1 & -2 & -2 \\ 3 & -1 & -1 & 3 \\ -3 & 1 & 1 & -3 \end{pmatrix}$$

ANSWER:  $\det(B) = 0$ , since row 2 is a scalar multiple of row 1.

$$C = \begin{pmatrix} 1 & -1 & 2 & 2 \\ 0 & 3 & 7 & 7 \\ 1 & 0 & 3 & 3 \\ 2 & -2 & 4 & 5 \end{pmatrix}$$

ANSWER:

$$\begin{aligned} \det(C) &= \begin{vmatrix} 1 & -1 & 2 & 2 \\ 0 & 3 & 7 & 7 \\ 0 & 1 & 1 & 1 \\ 2 & -2 & 4 & 5 \end{vmatrix} = \begin{vmatrix} 1 & -1 & 2 & 2 \\ 0 & 3 & 7 & 7 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 0 & 1 \end{vmatrix} = (-1) \begin{vmatrix} 1 & -1 & 2 & 2 \\ 0 & 1 & 1 & 1 \\ 0 & 3 & 7 & 7 \\ 0 & 0 & 0 & 1 \end{vmatrix} \\ &= (-1) \begin{vmatrix} 1 & -1 & 2 & 2 \\ 0 & 1 & 1 & 1 \\ 0 & 0 & 4 & 4 \\ 0 & 0 & 0 & 1 \end{vmatrix} = -1 \cdot 1 \cdot 4 \cdot 1 = -4. \end{aligned}$$