Name: Tuesday section time:

Student ID:

Math 20F - Linear Algebra - Winter 2003
Quiz #2 — January 21
(Do not discuss quiz with students who haven't taken it yet – until 8:00pm.)

1. Let $A = \begin{pmatrix} 1 & 2 & 3 \\ -1 & 0 & -1 \end{pmatrix}$.

   (a) What is A^T?   ANSWER: $A^T = \begin{pmatrix} 1 & -1 \\ 2 & 0 \\ 3 & -1 \end{pmatrix}$

   (b) Compute AA^T.   ANSWER: $AA^T = \begin{pmatrix} 14 & -4 \\ -4 & 2 \end{pmatrix}$

   (c) Does A have an inverse? Explain why or why not. (Watch out for this being a 'trick' question!)

   ANSWER: No, A is not invertible, since A is not square.

2. Let $B = \begin{pmatrix} 1 & 0 & 3 \\ 0 & 2 & 0 \\ 0 & 4 & 3 \end{pmatrix}$. Is B singular? If not, what is B^{-1}?

WORK:
$$\left(\begin{array}{ccc|ccc} 1 & 0 & 3 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 4 & 3 & 0 & 0 & 1 \end{array}\right) \Rightarrow \left(\begin{array}{ccc|ccc} 1 & 0 & 3 & 1 & 0 & 0 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & -2 & 1 \end{array}\right)$$

$$\Rightarrow \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 2 & -1 \\ 0 & 2 & 0 & 0 & 1 & 0 \\ 0 & 0 & 3 & 0 & -2 & 1 \end{array}\right) \Rightarrow \left(\begin{array}{ccc|ccc} 1 & 0 & 0 & 1 & 2 & -1 \\ 0 & 1 & 0 & 0 & \frac{1}{2} & 0 \\ 0 & 0 & 1 & 0 & -\frac{2}{3} & \frac{1}{3} \end{array}\right)$$

ANSWER: B is nonsingular. $B^{-1} = \begin{pmatrix} 1 & 2 & -1 \\ 0 & \frac{1}{2} & 0 \\ 0 & -\frac{2}{3} & \frac{1}{3} \end{pmatrix}$