

Write your name on the cover of the test booklet and nowhere else. Enclose this sheet with the booklet. Failure to follow these directions will cost you 1 point. The test has 100 points (to be scaled up to 170 points) and is scheduled to take 50 minutes. Therefore, expect to spend 1 minute for every 2 points. For example, a 12-point question should take 6 minutes. I cannot give much extra time.

Show all work for all questions.

1) (6 points) Suppose $A = \begin{bmatrix} 4 & 3 \\ 1 & -2 \end{bmatrix}$, $B = \begin{bmatrix} -3 & -1 \\ 2 & 4 \end{bmatrix}$. Find the matrix $2A+B^T$.

2) (6 points) Answer EITHER Part A OR Part B.

A) Prove that $\begin{bmatrix} 0.5 & 0.5 \\ 0.5 & 0.5 \end{bmatrix}$ is idempotent.

B) Find the trace of the matrix in Part A. Find the determinant of the matrix in Part A.

3) (10 points) Find the inverse of $A = \begin{bmatrix} 3 & 4 \\ 1 & 2 \end{bmatrix}$.

4) (10 points) If $f(x, y, z) = 5x^2 + 4xy + y/z$, then find $\partial f/\partial x$, f'_y , and f'_z .

5) (14 points) Set of the following equations in matrix format. $4X + 5Y = 23$. $X - Y = -1$. Use Cramer's Rule to solve the equations.

6) (20 points) Use the minor/cofactor/adjoint method to find the inverse of $\begin{bmatrix} 1 & 0 & 0 \\ -1 & 0 & 3 \\ 4 & 2 & 0 \end{bmatrix}$

7) (30 points) Suppose that \$1 worth of farm products (f) uses \$.2 worth of farm products, \$.1 of machinery (m) and \$.2 worth of energy (e). \$1 of machinery uses \$.1 of energy. \$1 of energy uses \$.5 of energy. Set up the open Leontief Input-Output Matrix. If there is demand for \$100 of farm products, \$30 of machinery, \$40 worth of energy, then how much of each must be made? Use any method you like assuming it uses matrices.

7B) (4 points) If \$1 of farm products uses 5 units of labor, \$1 of machines uses 3 units of labor, and \$1 of energy uses 1 unit of labor, then how much labor is needed? Make sure you set it up in matrix format before you give me the answer.