

Directions: Do not simplify unless indicated. Non-graphing calculators are permitted. Show all work as appropriate for the methods taught in this course. Partial credit will be given for any work, words or ideas which are relevant to the problem. All real-world problems should include units.

Please put problem 1 on answer sheet 1

1. (a) Use the Trapezoidal rule to approximate $\int_0^3 \sqrt{1+x^3} dx$ with $n = 6$ subintervals. [10 pts]
 (b) Consider the two tables shown. The first contains the price (in \$/lb) of flour and yeast (F and Y) at two different stores (S1 and S2). The second contains the amount (in lb/loaf) of flour and water necessary to make two different loaves of bread (L1 and L2).

\$/lb	F	Y	lb/loaf	L1	L2
S1	0.4	5	F	2	3
S2	0.5	4	Y	0.1	0.1

- i. What does the 0.4 represent? [2 pts]
 ii. What does the 3 represent? [2 pts]
 iii. Put these tables into matrices and multiply them in such a way that the result is meaningful. Describe what the resulting matrix represents. [6 pts]

Please put problem 2 on answer sheet 2

2. (a) Evaluate $\int x^3 \ln x dx$. [10 pts]
 (b) Find the average value of $f(x) = xe^{2x}$ on the interval $[0, 1]$. [10 pts]

Please put problem 3 on answer sheet 3

3. (a) Evaluate $\int_e^\infty \frac{1}{x(\ln x)^2} dx$. [15 pts]
 (b) If A is a 2×5 matrix and B is a matrix then why is it impossible for both $A + B$ and AB to make sense? [5 pts]

Please put problem 4 on answer sheet 4

4. Consider the system of equations

$$\begin{aligned} x + y + 2z &= 7 \\ y + z &= 3 \\ -x + 2y &= 1 \end{aligned}$$

- (a) Use Gauss-Jordan to solve the system. [15 pts]
 (b) Use the inverse of a matrix to solve the system. [5 pts]

Hint: $\begin{bmatrix} 1 & 1 & 2 \\ 0 & 1 & 1 \\ -1 & 2 & 0 \end{bmatrix}^{-1} = \begin{bmatrix} 2 & -4 & 1 \\ 1 & -2 & 1 \\ -1 & 3 & -1 \end{bmatrix}$

Please put problem 5 on answer sheet 5

5. (a) Find the inverse of $B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$. [5 pts]
 (b) Suppose the Leslie matrix for a population of juveniles and adults is shown below. Find a population of 1000 for which the ratio of juveniles to adults stays constant over time. By how much is the total population shrinking? [15 pts]

$$\begin{bmatrix} 0.2 & 0.3 \\ 0.4 & 0.1 \end{bmatrix}$$