

Mathematics 138 Spring 2003, Supplemental Final Review Sheet

The main review sheets for the final examination are the ones used for the first two midterms. This sheet contains some additional sample problems.

1. Calculate the area under the curve $y = x^2e^{-x}$ for $x \geq 0$.
2. Find the Maclaurin expansions of degree 6 for $(x + 2)^6$ and $\frac{\sin x}{x}$.
3. Calculate the following inverses:

(a) $\begin{bmatrix} 3 & 4 \\ 5 & 7 \end{bmatrix}^{-1}$

(b) $\begin{bmatrix} 2 & 2 & 2 \\ 0 & 2 & 2 \\ 0 & 0 & 2 \end{bmatrix}^{-1}$

4. Let $A = \begin{bmatrix} 3 & 0 & 1 \\ 2 & 3 & 0 \\ 0 & 2 & 0 \end{bmatrix}$.

Estimate A^{10} by finding the dominant eigenvalue and corresponding eigenvectors for A and A^T .

5. Analyze the following animal population using the Leslie model.

Age classes: 0 – 4, 5 – 9, 10 – 14 (5 year groupings).

Survival rates: 50% over five years, for each of the first two age classes. Close to 0 for the last age class (maximum life span about 15 years).

Fertility rates: on the average, each animal in each age class has one surviving offspring five years later.

Find the dominant eigenvalue numerically (use your calculator) and estimate the long-term growth rate for the population (about 8% annually).

Predict the long term age distribution. Answer: almost 70% juveniles, 23.5% aged 5-9, and about 8% aged 10 years or more.