

PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam

Mathematics for Computing

16-01-2012

Choose five problems.

1. Use the integral test to determine convergent or divergent.

$$\sum_{n=2}^{\infty} \frac{1}{n \ln n}$$

2. Find the interval of convergence for the power series.

$$\sum_{n=0}^{\infty} \frac{(-x)^n}{2^n(n+1)}$$

3. Use the first four terms of the Taylor series representation $e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$ to approximate the value of the improper integral.

$$\int_0^1 \frac{1 - e^{-x}}{x} dx$$

4. Evaluate $\det A$.

$$A = \begin{bmatrix} 3 & 5 & -2 & 6 \\ 1 & 2 & -1 & 1 \\ 2 & 4 & 1 & 5 \\ 3 & 7 & 5 & 3 \end{bmatrix}$$

5. Find the eigenvalues and eigenvectors for the matrix A .

$$A = \begin{bmatrix} 4 & -1 \\ 2 & 1 \end{bmatrix}$$

6. Find a formula for the inverse function $T^{-1}(x, y, z)$ of the linear operator $T : \mathbb{R}^3 \rightarrow \mathbb{R}^3$.

$$T(x, y, z) = (x + z, z + y - x, y)$$

7. Find the matrix for the linear transformation $T : \mathbb{R}^3 \rightarrow \mathbb{R}^2$ with respect to the basis $\{(1, 1, 1), (1, 2, 0), (2, 0, 3)\}$ for \mathbb{R}^3 and the basis $\{(1, 1), (3, 2)\}$ for \mathbb{R}^2 .

$$T(x, y, z) = (x - y + z, y - 2z)$$