

**MATH 181**  
**2nd Hour Midterm Exam**

1. Compute the indefinite integral: (10pts)

$$\int \frac{dx}{x^2 + 4x + 5}$$

2. Determine if the following improper integrals converge or not. If they do compute their value. (10 pts each)

$$\int_0^{+\infty} xe^{-x} dx \quad , \quad \int_1^{+\infty} \frac{x+1}{x^2+x+1} dx$$

3. Let  $R$  be the region in the  $xy$ -plane bounded by  $y = 0$  and  $y = x - x^2$  for  $0 \leq x \leq 1$ .

- i) Set up an integral to evaluate the volume of the solid obtained by revolving the region  $R$  about the line  $y = -3$ . (10 pts)  
ii) Compute the integral. (5 pts)

4. A retail store chain conducted a customer satisfaction survey. Each completed questionnaire was processed and produced a satisfaction level  $t$  between 0 (complete disappointment) and 1 (complete satisfaction). The subsequent analysis showed that the density function of the satisfaction level is given by  $p(t) = 3t^2$  for  $0 \leq t \leq 1$  (and 0 otherwise).

- i) Find what percentage of customers registered satisfaction level between  $\frac{1}{3}$  and  $\frac{2}{3}$ . (5 pts)  
ii) Find the mean value of  $t$ . (5 pts)  
iii) Find the median of  $t$ . (5 pts)

5. Compute the sum of the following series: (10 pts)

$$\sum_{n=2}^{+\infty} \frac{2}{3^{n+3}}$$

6. Determine whether the following series converge or not: (10 pts each)

$$\sum_{n=1}^{+\infty} \frac{(-1)^{n+1} n^3}{2^n} \quad , \quad \sum_{n=1}^{+\infty} \frac{3 + 2^{-n}}{\sqrt{n}} \quad , \quad \sum_{n=1}^{+\infty} \frac{(-1)^{-n}}{\sqrt{n^2 + n + 1}}$$

7. Determine the radius of convergence of the power series: (10 pts)

$$\sum_{n=1}^{+\infty} \frac{(-2)^n (x - 2)^n}{n^4}$$