Practice Final Calc-II

Compiled by: Haris

1) Estimate $\int_0^{\pi/2} \sin^6 x \, dx$ using the trapezoidal rule with $n = 3$ subdivisions. Show your work with a table of values.

2) Evaluate:

- **1)** $\int_0^1 \frac{1}{x^2+3x+2}\,dx$ (Factor the denominator)
- **2)** $\int x^2 \ln x\,dx$ (Indefinite integral)

3) Evaluate $\int_0^1 \frac{1}{(x^2+1)^2}\, dx$ using $x = \tan u$. Transform the limits.

4) For what values of p does $\sum_{n=1}^{\infty} \frac{1}{\sqrt{4+n^p}}$ converge? Justify.

5) Use trigonometric substitution to evaluate $\int_0^1 \frac{1}{(4+x^2)^{3/2}}\ dx$.

6) Evaluate:

1) $\int_0^1 \frac{x}{\sqrt{1+3x^2}}\ dx$

2) $\int_{\pi/3}^{\pi/2} \cos^3 x \sin(2x)\ dx$

7) Analyze convergence (state tests used):

1) $\sum_{n=1}^{\infty} \frac{\sqrt{k}}{\sqrt{k}+3}$

2) $\sum_{n=1}^{\infty} \frac{1}{k!}$

8) Determine absolute convergence:

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

2) $\sum_{n=1}^{\infty} (-1)^{k+1} \frac{\ln k}{\sqrt{k}}$

9) Prove: If $\sum_{n=1}^{\infty} |a_n|$ converges, then $\sum_{n=1}^{\infty} a_n^2$ converges.

10) Find parametric equations for:

  1) Circle radius 5, centered at origin, clockwise

  2) Vertical line through $x = 2$, oriented upward

11) Show the length L of one cycloid arch is $L = a\int_0^{2\pi} \sqrt{2(1-\cos\theta)}\, d\theta$.

12) Sketch polar curves:

1) $r = -3 - 4\sin\theta$

2) $r^2 = \cos 2\theta$

13) Find the area of the shaded region (include figure).

14) Analyze conic sections (find center, foci, vertices, asymptotes, eccentricity):

1) $x^2 + 2y^2 - 2x - 4y = -1$

2) $9x^2 + 6y^2 - x + 36y = 0$

15) Evaluate:

1) $\int_0^2 \sqrt{4 - x^2}\ dx$

2) $\int \frac{e^x - x - 1}{4x^2}\ dx$

16) Rotate axes to eliminate xy-term in $3x^2 + 4\sqrt{3}xy - y^2 = 7$ and identify the conic.

17) Find the area within $r = 1 + \sin\theta$ in the first quadrant.

18) Polar equations of lines:

1) Show vertical lines have form $r = a/\cos\theta$

2) Find polar equation for horizontal lines

19) Find intersection points of $r^2 = \sqrt{2}\sin\theta$ and $r^2 = \sqrt{2}\cos\theta$, and their slopes at these points.

20) Find area and arc length of $r = \sqrt{1 + \cos(2\theta)}$ for $0 \leq \theta \leq \pi/\sqrt{2}$.