Calculus II, Final Examination Fall 2025

Choose 2 problems to skip, 10 points each

1. Find the area bounded by of $y = \sin x, y = \cos x$ and $x = -\pi/2, x = \pi$.
2. Find the volume of the solid by revolving around the x-axis the region bounded by $y = x^3$, $y = x^2, x \geq 0$.
3. Find the volume of the solid by revolving the region bounded by $y = \ln x$, $x = 1, x = e$ around y-axis.
4. Determine the interval of convergence of $\sum_{n=7}^{\infty} \frac{(x+1)^n}{4^n}$.
5. Find the integral $\int e^{-2x} \cos(5x)\ dx$.
6. Find the integral $\int x^2 (\ln x)^2\ dx$.
7. Find the integral $\int \tan^3 x\ \sec^3 x\ dx$.
8. Find the integral $\int \frac{1}{(x+1)(2x-1)(3x-1)}\ dx$.
9. Evaluate $\int_9^{\infty} \frac{\ln x}{x^9}\ dx$ if it converges, or give the reason it diverges.
10. Evaluate $\int_2^5 \frac{1}{(x-1)\sqrt{(x-2)}}\ dx$.
11. Find arc-length of $y = (1/4)x^2 - (1/2)\ln x$ from $x = 1$ to $x = 4$.
12. Find surface area of the solid obtained by rotating the curve $y = 2x^3$ about the x-axis from $x = 0$ to $x = 2$.
13. Find the length of the curve $x = t\cos t, y = t\sin t, 0 \leq t \leq 1$.
14. Write the equation $xy = 2$ in polar coordinates.
15. Write the polar equation $r = \cos\theta - \sin\theta$ in xy coordinates and sketch it.
16. Name the curve $x^2 - 3x + (y+3)^2/3 = 4$ and find its center.
17. Find the area of the region enclosed by the curve $r = \cos 2\theta$.
18. True or false: Alternating series $\sum_{n=3}^{\infty} (-1)^n \frac{1}{\sqrt{n(n^2-1)}}$ converges conditionally.
19. Determine convergence or divergence of $\sum_{n=7}^{\infty} \frac{n^3}{3^n}$.
20. Determine convergence or divergence of $\sum_{n=4}^{\infty} \frac{n!}{n^n}$.
21. Determine convergence or divergence of $\sum_{n=6}^{\infty} \frac{1}{(\ln n)^n}$.
22. Find the Taylor's series of $x + e^{-2x}$ around $x = 0$.