Calculus II, Final Examination Spring 2025

Choose 2 problems to skip, 10 points each

1. Find the area between graphs of  $y = x^2 - 13x + 42$  and y = 0.

2. Find the volume of the solid by revolving around the x-axis the region bounded by  $y=x^2,\,y=|x|,x\geq 0$  .

3. Find the volume of the solid by revolving the region of  $y = x^2$ , x = 4, y = 0 around y-axis.

- 4. Determine the interval of convergence of  $\sum_{n=7}^{\infty} \frac{x^n}{3^n}$ .
- 5. Find the integral  $\int e^{-3x} \cos(3x) dx$ .
- 6. Find the integral  $\int x(\ln x)^2 dx$ .
- 7. Find the integral  $\int \tan^3 x \sec^4 x \, dx$ .
- 8. Find the integral  $\int \frac{1}{(x+1)(x-2)(x+3)} dx$ .
- 9. Evaluate  $\int_3^\infty \frac{\ln x}{x^2} dx$ .
- 10. Evaluate  $\int_{3}^{7} \frac{1}{\sqrt{(x-3)(7-x)}} dx$ .
- 11. Find arc-length of  $y = (1/4)x^2 (1/2)\ln x$  from x = 1 to x = 2.

12. Find surface area of the solid obtained by rotating the curve  $y = x^3$  about the x-axis from x = 0 to x = 2.

- 13. Find the length of the curve  $x = t \cos t, y = t \sin t, 0 \le t \le 1$ .
- 14. Write the equation 2y = 1 + 3x in polar coordinates.
- 15. Write the polar equation  $r = \cos \theta$  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  $r = \sin 2\theta$ .

18. True or false: Alternating series  $\sum_{n=3}^{\infty} (-1)^{n-1} \frac{1}{\sqrt{n(n-1)}}$  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  $1 + e^{-2x}$  around x = 0.