

Your Name:

Instructor: Steven Clontz

Draw a box around your final answer. You must show all work to receive credit.

1. Use the washer method to find the volume of the solid obtained by rotating the region bounded by $y = 0$, $y = \sqrt{x}$, and $x = 4$ around the line $y = -1$.

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2. Now use the cylindrical shell method to find the volume of the solid from question #1.
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3. Find the length of the curve given by the parametric equations $x = \cos(t^2 + \pi)$ and $y = \sin(t^2 + \pi)$ for $0 \leq t \leq \pi$.

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4. A conical tank of height 9m and radius 3m stands on its point. A liquid weighing 10,000 N/m³ is pumped into the tank from its point. How much work is done in filling the tank to a height of 3m?
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5. Find $\int e^w \sin(w) dw$.

6. Use trigonometric substitution to find $\int \frac{v}{\sqrt{4-9v^2}} dv$

7. Find $\int \frac{8s^4 + 8}{s^3 - 4s} ds$.

8. Evaluate $\int_e^\infty \frac{1}{\theta(\ln \theta)^2} d\theta$.

9. Show that the sequence $a_n = \frac{n+1}{n^2}$ converges or diverges.

10. Show that the series $\sum_{k=2}^{\infty} \frac{k}{4+k^2}$ converges or diverges.

11. Show that the series $\sum_{j=0}^{\infty} \frac{\pi^j}{2(3^j)}$ converges or diverges.

12. Show that the series $\sum_{i=1}^{\infty} \frac{2}{3^i} - \frac{2}{3^{i+1}}$ converges or diverges.

13. Show that $\sum_{n=0}^{\infty} \frac{(-2)^n}{3^{2n}}$ converges absolutely, converges conditionally, or diverges.

14. Find the interval and radius of convergence for $\sum_{n=1}^{\infty} \frac{(4x - 1)^n}{\sqrt{n^3}}$.

15. Find the Maclaurin Series generated by $f(x) = \frac{e^x + e^{-x}}{2}$.

16. Express $\int e^{x^3} dx$ as a power series.

17. Give a polynomial of degree 6 which approximates $f(x) = \sqrt[3]{1+x^3}$.

18. Sketch the polar graph of $r = 4 - 4 \cos(\theta)$.

19. Find the area of the region bounded by the polar equation $r = 4 - 4 \cos(\theta)$.

20. Find the length of the perimeter of the region bounded by the polar equation $r = 4 - 4 \cos(\theta)$.
