I. EVALUATE EACH INTEGRAL. BE SURE TO SHOW YOUR WORK. YOU DO NOT NEED TO SIMPLIFY YOUR RESULT.

1. $\int \cos^2(x)dx$

2. $\int x\sec^2(x)dx$

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3. $\int \frac{1}{x^2 - 5x + 6}dx$

4. $\int \frac{x^2}{2\sqrt{4 - x^2}}dx$

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5. $\int \tan^3(x)\sec(x)dx$

6. $\int \sin(x)\, e^x \, dx$

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7. $\int_{-1}^{\infty} e^{(-x)}dx$

8. $\int_{4}^{13} \frac{1}{\sqrt{x-4}}dx$

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9. $\int \frac{x^2 + 4x + 1}{x^3 + x}dx$

10. $\int \frac{x^3}{\sqrt{x^2 + 4}} dx$

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II. FIND THE DERIVATIVE OF EACH FUNCTION.

11. $f(x) = \sin(\tan^{-1}(x))$

12. $f(x) = \frac{\sin^{-1}(3x)}{x^2}$

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III. EVALUATE EACH LIMIT. FOR THIS SECTION YOU MAY <u>NOT</u> USE THE DOMINANT TERM RULE.

13. $\lim_{x\to\infty} \frac{x^2}{e^x}$

14. $\lim_{x\to 1+} \frac{1 - x + \ln(x)}{x^3 - 3x + 2}$

IV. COMPUTE THE ARC LENGTH OF THE GIVEN FUNCTION ON THE GIVEN INTERVAL. THE INTEGRAL IS ONE YOU WILL BE ABLE TO COMPUTE. COMPUTE IT!

15. THE FUNCTION $f(x) = \ln(\cos(x))$

ON THE INTERVAL $[0, \pi/4]$

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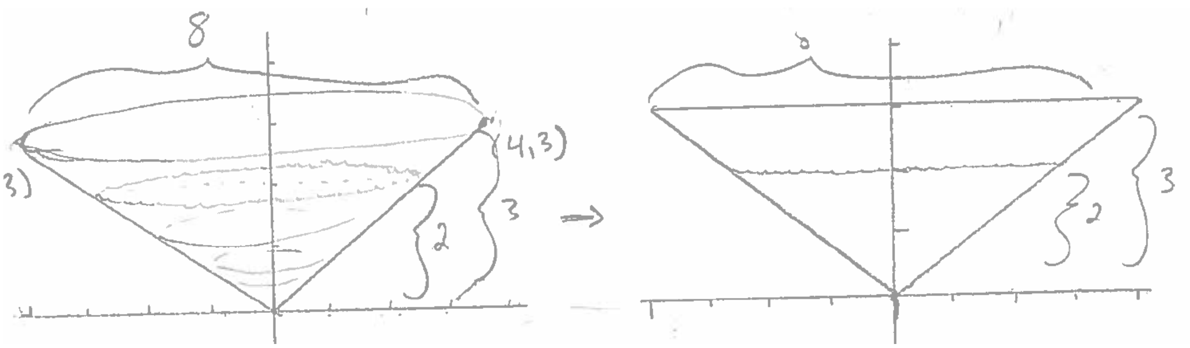
V. A TANK CONTAINS FUEL OIL WITH DENSITY CONSTANT = ρ. THE TANK IS IN THE SHAPE OF AN INVERTED CONE (SEE PICTURES) WITH HEIGHT OF 3 METERS AND BASE DIAMETER OF 8 METERS, AND IS FILLED TO ADEPTH OF 2 METERS. THE OIL IS TO BE ELEVATED AND EMPTIED OVER THE TOP EDGE OF THE TANK.

16. SET UP AN INTEGRAL WHICH WILL FIND THE AMOUNT OF WORK DONE ACCOMPLISHING THIS TASK.



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VI. DETERMINE THE CONVERGENCE OR DIVERGENCE OF EACH SERIES.

(A) STATE THE NAME OF THE TEST YOU USE

(B) IF A CONVERGENT SERIES IS GEOMETRIC OR TELESCOPING, FIND THE SUM OF THE SERIES.

17. $\sum_{n=1}^{\infty} \frac{n^3+n}{n^6+6}$

18. $\sum_{n=1}^{\infty} \frac{(-1)^{n+1} e^{(3n)}}{(2n)!}$

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19. $\sum_{n=0}^{\infty} 9\left(\frac{e}{5}\right)^n$

20. $\sum_{n=1}^{\infty} \frac{(-1)^n (n+1)}{n^3+n}$

II. FOR EACH POWER SERIES, DETERMINE THE CENTER, INTERVAL, AND RADIUS OF CONVERGENCE.

21. $\sum_{n=1}^{\infty} \frac{(-1)^n (x+3)^n}{2n}$

22. $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n+1)!}$

23. $\sum_{n=1}^{\infty} \frac{(2n)!\, x^{n+1}}{(n)}$