

1. (27 points) Put your **answers** in the spaces provided. You do not have to show any work for this problem.

(a)  $\sum_{n=0}^{\infty} \frac{1}{3^{n+2}} =$

(b)  $\int \frac{dx}{\sqrt{1-x^2}} =$

(c)  $\frac{d}{dx} \sum_{n=1}^{\infty} \frac{x^n}{n^4} =$

(d) Write the power series centered at 0 for  $e^{-x}$ .

(e) If the endpoints of the interval of convergence of a power series are 3 and 7 then what are the center and the radius of convergence?

(f) The denominator of a rational function is  $x^3(x^2+1)$ . What is the general form of the partial fraction decomposition?

(g) What is the *definition* of  $\ln 5$ ?

(h) What trig substitution should you use in calculating  $\int (4x^2 - 25)^{3/2} dx$ ?

(i) Write the formula for the area of the surface obtained by rotating the curve with equation  $y = f(x)$  for  $a \leq x \leq b$  around the X axis.

2. (8 points) Show your work:  $\lim_{x \rightarrow \infty} (e^x - x)^{-1/x} =$

3. (8 points) Find the partial fraction decomposition for  $\frac{x^2 - 2x + 2}{x^3 + x}$ . You must determine the unknown coefficients. **This problem does not ask you to calculate an integral.**

4. (9 points)  $\int_0^{\infty} \frac{dx}{(x+2)^3} =$

5. (9 points)  $\int_0^{\pi} x \sin 2x dx =$

6. (9 points)  $\int \sqrt{25 - x^2} dx =$

7. (9 points)  $\int \cos^3 x \sin^{10} x \, dx =$

8. (12 points) For the series  $\sum_{n=2}^{\infty} \frac{(-1)^n}{2n-1}$ :

(a) (1 point) Does the series converge? Circle your answer: 

Yes	No
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(b) (5 points) Justify your answer.

(c) (1 point) Does the series converge absolutely? Circle your answer: 

Yes	No
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(d) (5 points) Justify your answer.

9. (8 points) For the series  $\sum_{n=0}^{\infty} \frac{n^4}{n!}$ :

(a) (1 point) Does the series converge? Circle your answer: 

Yes	No
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(b) (7 points) Justify your answer.

10. (8 points) Using Taylor's formula for the coefficients, find the first four non-zero terms in the power series expansion of  $f(x) = \sqrt{x}$ , **centered at 1**.

11. (8 points) Find the radius of convergence of  $\sum_{n=1}^{\infty} \frac{x^{2n}}{n9^n}$ . Show your work.

12. (15 points) A curve is given parametrically as

$$x = t^2 + 2t \quad y = t^2 - 6t$$

(a) Find  $\frac{dy}{dx}$

(b) Find the XY coordinates of all points with a horizontal tangent.

(c) Find the XY coordinates of all points with a vertical tangent.

(d) Find the the XY coordinates of the two points where this curve crosses the Y axis.

(e) Write an integral for the arc length of the portion of the curve between the two points that you found in part (d). **Do not evaluate the integral.**

13. (20 points)

(a) (10 points) Graph  $\rho = 2 + 4 \sin^2 \theta$  using the plotting grid on page 13.

(b) (5 points) Write an integral for the area enclosed by the curve. **Do not evaluate the integral.**

(c) (5 points) Find all points of intersection of this curve with the curve given by  $\rho = 4 \cos^2 \theta$