Name: ______________________________

Student ID: ______________________________

Section: ______________________________

Instructor: ______________________________

Math 2414 (Calculus II) Practice Final

Instructions:

- Work on scratch paper will not be graded.
- Show all your work in the space provided. Full credit will be given only if the necessary work is shown justifying your answer.
- **Please write neatly. If I cannot read your handwriting, you will not receive credit.**
- Simplify your answers as much as possible. Expressions such as $\ln(1)$, e^0, $\sin(\pi/2)$, etc. must be simplified for full credit.

Show all work in the space provided. Full credit will be given only if all steps are shown justifying your answer. Please write neatly and carefully, if I cannot read your handwriting, you will receive NO credit.

1. (10 points) Find the volume of the solid formed by revolving the region bounded by the given graphs about the x-axis
$$y = e^{x/4}, y = 0, x = 0, x = 6.$$

2. (10 points) Find the arc length of the curve $y = \ln(\sin(x))$ over the interval $[\frac{\pi}{4}, \frac{3\pi}{4}]$

3. (10 points) Find the area of the surface generated by revolving the curve $y = 1 - \frac{x^2}{4}$ on the interval $[0, 2]$ about the y-axis.

4. (10 points) Find the integral $\int_1^2 x^4(\ln(x))^2 dx$.

5. (10 points) Use the product-to-sum formula to find the integral $\int \sin(6x)\cos(4x)dx$.

6. (10 points) Find the integral $\int \frac{e^x}{(e^x - 2)(e^{2x} + 1)} dx$. (Hint: u-sub and partial fractions.)

7. (10 points) Find the radius of convergence the given series.

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

8. (10 points) Explain why the integral test can be applied to the series. Then apply the test to determine whether the series converges or diverges.

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

9. (10 points) Find the 3rd Taylor polynomial $T_3(x)$ centered at 4 for the function $f(x) = \sqrt{x}$.

10. (10 points) Find the area of the region that lies inside the first curve and outside the second curve:

$$r = 3\cos\theta \text{ and } r = 1 + \cos\theta.$$

END OF EXAM