Some stuff

\[
\frac{1}{1-u} = 1 + u + u^2 + u^3 + u^4 + u^5 + \ldots = \sum_{n=0}^{\infty} u^n \quad -1 < u < 1
\]

\[
e^u = 1 + u + \frac{u^2}{2} + \frac{u^3}{3!} + \frac{u^4}{4!} + \frac{u^5}{5!} + \ldots = \sum_{n=0}^{\infty} \frac{u^n}{n!} \quad -\infty < u < \infty
\]

\[
\sin u = u - \frac{u^3}{3!} + \frac{u^5}{5!} - \frac{u^7}{7!} + \frac{u^9}{9!} - \ldots = \sum_{n=0}^{\infty} (-1)^n \frac{u^{2n+1}}{(2n+1)!} \quad -\infty < u < \infty
\]

\[
\cos u = 1 - \frac{u^2}{2!} + \frac{u^4}{4!} - \frac{u^6}{6!} + \frac{u^8}{8!} - \ldots = \sum_{n=0}^{\infty} (-1)^n \frac{u^{2n}}{(2n)!} \quad -\infty < u < \infty
\]

\[
\tan^{-1} u = u - \frac{u^3}{3} + \frac{u^5}{5} - \frac{u^7}{7} + \frac{u^9}{9} - \ldots = \sum_{n=0}^{\infty} (-1)^n \frac{u^{2n+1}}{2n+1} \quad -1 \leq u \leq 1
\]

\[
\ln(1-u) = -u - \frac{u^2}{2} - \frac{u^3}{3} - \frac{u^4}{4} - \ldots = -\sum_{n=1}^{\infty} \frac{u^n}{n} \quad -1 < u < 1
\]
1*. Integrate \( \int xe^{2x} \, dx \). Show all steps.

2. Integrate \( \int_1^\infty \frac{e^{-\sqrt{x}}}{\sqrt{x}} \, dx \). Show all steps.

3*. Find the slope of the tangent line to the curve
\[
\begin{align*}
x &= 2\cos t + \sin 2t \\
y &= 2\sin t + \cos 2t
\end{align*}
\]
where \( t = 0 \).

4. Set up definite integrals that represent the area inside \( r = 2 \) and outside \( r = 3 + 2\cos \theta \). You may use your calculator to evaluate the integrals.

5. Write parametric equations for the line through \((2, 0, 1)\) and that is perpendicular to both \( \langle 0, \ 2, \ 1 \rangle \) and \( \langle 1, \ 0, \ 2 \rangle \).

6*. Write an equation of the plane that contains the points \((1, -2, 1), (2, -1, 0), (3, -2, 2)\).
7. Set up a definite integral that represents the arc length of

\[ x = 2 \cos t + \sin 2t \quad \text{for} \quad 0 \leq t \leq 2\pi \]
\[ y = 2 \sin t + \cos 2t \]

You may use your calculator to evaluate the integral.

Determine whether each of the following series (# 8 – 10) is absolutely convergent, conditionally convergent, or diverges. If the series is a convergent geometric series, find its sum. State the test you are using and show all details of the test. Always verify the conditions needed for the test to be valid.

8*. \[ \sum_{k=3}^{\infty} \frac{1}{k^3 - 5k} \]

9. \[ \sum_{k=0}^{\infty} \frac{1}{2} \left( -\frac{1}{3} \right)^k \]

10. \[ \sum_{k=1}^{\infty} \frac{4k}{k + 2} \]
11. Determine the interval of convergence of the power series

\[ \sum_{k=0}^{\infty} \frac{k}{3^{k+1}} x^k. \]

12*. Find the Maclaurin series for \( \int_{0}^{x} t \cos t^3 \, dt. \)

13. Use a Maclaurin series to calculate \( \cos 0.34 \) so that the absolute value of the error is less than 0.000005.