

1. (3 points) Find the interval of convergence for $S = \sum_{n=1}^{\infty} \frac{\sqrt{n}(x+6)^n}{8^n}$. Defend your answer with appropriate work.

2. (2 points) Use differentiation (not substitution) to find the Taylor polynomial of degree three about $x = 1$ for $f(x) = x \ln(x)$.

3. (2 points) Find all values of x in the interval $[-\pi, \pi]$ for which $e^{ix} = \frac{1 + i\sqrt{3}}{2}$. Show work or explain how you found your answer.
4. (1 point) Find the Taylor Series for $f(x) = e^{2x}$ about $x = 0$ using a famous Taylor series and substitution.
5. (2 points) Estimate $I = \int_0^1 \cos(x^2) dx$ using the first three nonzero terms of the Maclaurin series for $\cos(x^2)$. Use substitution again to obtain the series easily.