

Physics 116A Practice Midterm

Eric Reichwein
Department of Physics
University of California, Santa Cruz

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1. Find the limit of the given sequence as $n \rightarrow \infty$

$$\frac{(n+1)^2}{\sqrt{3+5n^2+4n^4}} \quad (1)$$

2. Find the interval of convergence of:

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

be sure to investigate the endpoints of the interval.

3. Find the following limits using Maclaurin series

A. $\lim_{x \rightarrow 0} \left(\frac{1}{x} - \frac{1}{e^x - 1} \right)$

B. $\lim_{x \rightarrow 0} \left(\frac{1}{x^2} - \frac{\cos x}{\sin^2 x} \right)$

C. $\lim_{x \rightarrow 0} \left(\csc^2 x - \frac{1}{x^2} \right)$

D. $\lim_{x \rightarrow 0} \left(\frac{\ln(1+x)}{x^2} - \frac{1}{x} \right)$

4. Find the disk of convergence for the following complex power series.

$$\sum_{n=0}^{\infty} \frac{(n!)^3 z^n}{(3n)!} \quad (3)$$

5. Find all values of the roots of

$$\sqrt[3]{2i-2} \quad (4)$$

6. Evaluate each of the following in $x + iy$ form

A. $(-i)^{\sin i}$

B. $\cos(2i \ln i)$

7. Express the following integrals as a Γ function.

$$\int_0^1 \sqrt[3]{\ln x} dx \quad (5)$$

8. Evaluate the integral as a B , and then express in terms of Γ functions.

$$\int_0^1 \frac{dx}{\sqrt{1-x^3}} \quad (6)$$