

Physics 116C
Homework 4
due 10/25/07

1. Find the general solution to the equation

$$\frac{d^2y}{dx^2} + xy = 0 \quad (1)$$

using the method of power series solution, section 12.1 of Boas.

2. Boas Chapter 12, section 2, problem 2.

3. Boas Chapter 12, section 3, problem 3.

4. (a) Calculate

$$\int_{-1}^1 \frac{P_l(x)}{\sqrt{1 - 2x \cos \theta + \cos^2 \theta}} dx \quad (2)$$

Hint: See Chapter 12 section 5, and use Chapter 12 Eq. (8.4).

5. Solve the differential equation

$$\frac{d^{13}y}{dx^{13}} = P_{13}(x) \quad (3)$$

with the boundary conditions

$$\left. \frac{d^{12}y}{dx^{12}} \right|_{x=1} = \left. \frac{d^{11}y}{dx^{11}} \right|_{x=1} = \dots = \left. \frac{dy}{dx} \right|_{x=1} = 0 \quad (4)$$

Hint: See Chapter 12 section 4.

6. Find the solution to the equation

$$\frac{d}{dx} \left((1 - x^2) \frac{dy}{dx} \right) + 6y = x \quad (5)$$

with the conditions that the solution be finite everywhere for $-1 \leq x \leq 1$ and $y(x=0) = -1$.

Hint: Consider the homogeneous equation first, and then find a particular solution.