Math background test for Physics 316, Modern Physics I (Hoffstaetter/Hinderer/Thibault) Date: Wednesday, 01/28/04

0) Have you taken the prerequisite math courses?

1) Use complex numbers to derive the following equation:

$$\sin(2\alpha) = 2\sin(\alpha)\cos(\alpha) . \tag{1}$$

2) What is the general solution of the following ODE?

$$x'' = kx$$
 , $k < 0$. (2)

What is the general solution for k > 0?

- **3)** What is $5e^{i\pi/2} \cdot 3e^{-i\pi/4}$?
- 4) What is $5e^{i\pi/2} + 3e^{-i\pi/4}$?
- 5) Solve the following indefinite integral:

$$\int \frac{1}{x} dx \ . \tag{3}$$

6) Solve the following integral:

$$\int_0^\pi \cos^2 \phi \sin \phi d\phi \ . \tag{4}$$