Math background test for Physics 316, Modern Physics I (Hoffstaetter/Drasco/Thibault)
Date: Monday, 01/24/05

**0)**  Do you have the math requirements?
Math190 or 191: analytic geometry, differential and integral calculus
Math192: vectors and calculus of functions of several variables through double and triple integrals
Co-registration in at least Math294: Linear algebra

**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?

$$\frac{d^2}{dt^2}x = kx \ \ , \ \ k < 0 \ . \tag{2}$$

What is the general solution for $k > 0$?

**3)**  Please simplify $5e^{i\pi/2} \cdot 3e^{-i\pi/4}$.

**4)**  What is the real and imaginary part of $5e^{i\pi/2} + 3e^{-i\pi/4}$?

**5)**  Solve the following indefinite integral:

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

**6)**  Solve the following integral:

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