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:

$$
\begin{equation*}
\sin (2 \alpha)=2 \sin (\alpha) \cos (\alpha) \tag{1}
\end{equation*}
$$

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

$$
\begin{equation*}
x^{\prime \prime}=k x \quad, k<0 . \tag{2}
\end{equation*}
$$

What is the general solution for $k>0$ ?
3) What is $5 e^{i \pi / 2} \cdot 3 e^{-i \pi / 4}$ ?
4) What is $5 e^{i \pi / 2}+3 e^{-i \pi / 4}$ ?
5) Solve the following indefinite integral:

$$
\begin{equation*}
\int \frac{1}{x} d x . \tag{3}
\end{equation*}
$$

6) Solve the following integral:

$$
\begin{equation*}
\int_{0}^{\pi} \cos ^{2} \phi \sin \phi d \phi \tag{4}
\end{equation*}
$$

