

Phys 3010 Mathematical Physics

Assignment 5

Before doing this assignment you might want to review the chapter in your General Physics textbook on oscillators. Also, remember that $e^{i\theta}$ always stands for $\cos(\theta) + i \sin(\theta)$, where $i^2 = -1$.

- Using the product of two exponentials, $e^{i(A+B)} = e^{iA} e^{iB}$ derive the expressions for the cosine and sine of the sum of two angles
 - $\cos(A+B) =$
 - $\sin(A+B) =$
- In the previous question put $B = -A$ to show that $\cos^2(A) + \sin^2(A) = 1$.
- Using trigonometric notation the position of an oscillator as a function of time is given by

$$x = A \cos(\omega t + \varphi)$$

- What do the symbols A , ω , and φ stand for?
 - Find the expression for the speed of the oscillator.
 - Find the expression for the acceleration of the oscillator.
- Converting the above expression to complex notation

$$x = A e^{i(\omega t + \varphi)}$$

- Find the speed of the oscillator in complex notation. Remembering that only the real part of the expression is meaningful, show that this gives the same speed as in part b of the previous question.
- Find the acceleration of the oscillator in complex notation. Remembering that only the real part of the expression is meaningful, show that this gives the same acceleration as in part b of the previous question.