**Review of Mathematics for Physics worksheet (Nitipat Pholchai) on oscillatory motion**

1. Expand trigonometric function in terms of sinusoidal

Answer:

Hint : Use Euler’s formula where to turn a geometric problem into an algebraic problem

1. Use the same technique to prove the expressions and
2. Symmetry and periodicity of sinusoidals. Can you ‘visualize’ these properties on the unit circle or the graph of sinusoidal?
   1. We say that sine is an ‘antisymmetric’ function
   2. We say that cosine is a ‘symmetric’ function. What can we say about the derivative of any symmetric function at zero if it exists?
   3. How about , in terms of ?
   4. How about , in terms of ?
3. Rewrite the general solution of an ordinary differential equation with 2 arbitrary constants and in another form with 2 arbitrary constants X and Y

Where may be interpreted as amplitude (maximum displacement) and is initial phase of the oscillation at angular frequency . Find the relationship between the two sets of arbitrary constants.

In other words, write X, Y and C,D in terms of A and B (even better if you can have a geometrical interpretation of them, what we call “phasor” or quadrature)

Answer :

C and D are now complex, but real “physical” solution requires

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in other words the second term is complex conjugate of the first, (A complex constant is made up of two real constants)

1. Review questions
   1. How do we know that general solution to the differential equation is of particular form (ansatz guess based on intuition about functions and their derivatives, substitution)
   2. Our understanding of Linear algebra, vector-space of functions can help us a great deal!
2. Example 3.2 Serway: adding vectors in 2 dimensions
   1. Use of sine law and cosine law. Geometrical method
   2. Use of algebraic method