Mathematical Methods

A Little Practice

PHYSICS 204, DANIEL A. MARTENS YAVERBAUM JOHN JAY COLLEGE OF CRIMINAL JUSTICE, THE CUNY

I. DERIVATIVES

A) Given $x = A \cos(\omega t)$, find:

i.
$$\frac{dx}{dt} =$$

ii. $\frac{d^2x}{dt^2} =$

B) Is $x = A\cos(\omega t)$ a solution to $\frac{d^2x}{dt^2} = -\omega^2 x$? Why or why not?

C) Is $x = A\cos(5t)$ a solution to $\frac{d^2x}{dt^2} = -3x$? Why or why not?

D) Given
$$x = A \cos(5t)$$
, find:

i.
$$\frac{dx}{dt} =$$

ii. $\frac{d^2x}{dt^2} =$

E) Given
$$x = A \cos(\sqrt{k/m} \cdot t)$$
, find:

iii.
$$\frac{dx}{dt} =$$

iv. $\frac{d^2x}{dt^2} =$

F) Given $x = A\cos(\omega t + 3.5)$, find:

iii.
$$\frac{dx}{dt} =$$

iv. $\frac{d^2x}{dt^2} =$

G) Is $x = A\cos(\omega t + 3.5)$ a solution to $\frac{d^2x}{dt^2} = -\omega^2 x$? Why or why not?

H) Given
$$x = e^{-\omega t}$$
, find:

i.
$$\frac{dx}{dt} =$$

ii. $\frac{d^2x}{dt^2} =$

I) Is
$$x = e^{-\omega t}$$
 a solution to $\frac{d^2x}{dt^2} = -\omega^2 x$? Why or why not?

J) Given
$$x = e^{i\omega t}$$
 ($i \equiv \sqrt{-1}$), find:

i.
$$\frac{dx}{dt} =$$

ii. $\frac{d^2x}{dt^2} =$

K) Is $x = e^{i\omega t}$ a solution to $\frac{d^2x}{dt^2} = -\omega^2 x$? Why or why not?

II. COSINE FUNCTIONS

A) Given $x = 4\cos(\pi t)$,

- i. At t = 0, what will be the value of x?
- ii. Find two values of t for which x = 0.
- iii. Find two values of t for which x = 4.
- iv. Find a value of t for which x = -4.
- v. Find a value of t for which x = 2.
- vi. What is the maximum possible value of x?

B) Given
$$x = 4\cos\left(2\pi t + \frac{\pi}{2}\right)$$
,

vii. When t = 0, what is the value of x?

viii. Find a value of t for which x = 4.

ix. Find a value of t for which x = 0.