

PHYS 301

HOMEWORK #6

Due : 12 March 2012

Do the problems on this assignment by hand; you may use Mathematica to verify answers, but not to find your solutions. Remember to show all your work for each question.

1. Determine the amplitude, period and velocity amplitude for the motion of a particle whose distance from the origin is described by :

a) $s = 3 \cos 5 t$

b) $s = 2 \sin 3 t \cos 3 t$

c) $s = 3 \sin (2 t + \pi / 8) + 3 \sin (2 t - \pi / 8)$

As always, show complete solutions. 6 pts for each part.

2. Using trig identities as appropriate, show by explicit integration that :

$$\int_{-\pi}^{\pi} \cos m x \sin n x dx = 0 \text{ where } m, n \text{ are integers}$$

3. Using trig identities as appropriate, show by explicit integration that :

$$\frac{1}{2\pi} \int_{-\pi}^{\pi} \cos m x \cos n x dx = \begin{cases} 0, & m \neq n \\ \frac{1}{2}, & m = n \neq 0 \\ 1 & m = n = 0 \end{cases}$$

where m and n are integers.

4. Find the value of the integral :

$$\int x \cos (n x) dx \text{ where } n \text{ is an integer}$$

5. Find the value of the integral :

$$\int x^2 \sin (n x) dx \text{ where } n \text{ is an integer}$$