

**Math 207C**  
**Homework 6**  
**Due Friday, May 25th**

1. The dimensionless equation of motion of a frictionless pendulum is

$$\frac{d^2\theta}{dt^2} + \sin\theta = 0.$$

In the limit of small amplitude, the period is  $2\pi$  to leading order. Compute the next term in the expansion of the period for small amplitude.

2. For appropriate values of  $a$  (depending on  $\epsilon$ ) the solution to

$$\frac{d^2y}{dt^2} + (a + \epsilon \cos(t))y = 0$$

is periodic with period  $2\pi$ . Find the leading order  $\epsilon$  dependence of the curve  $a(\epsilon)$  so that the solution of the above equation is  $2\pi$ -periodic for the case  $a(0) = 1$ . There are two such curves.