

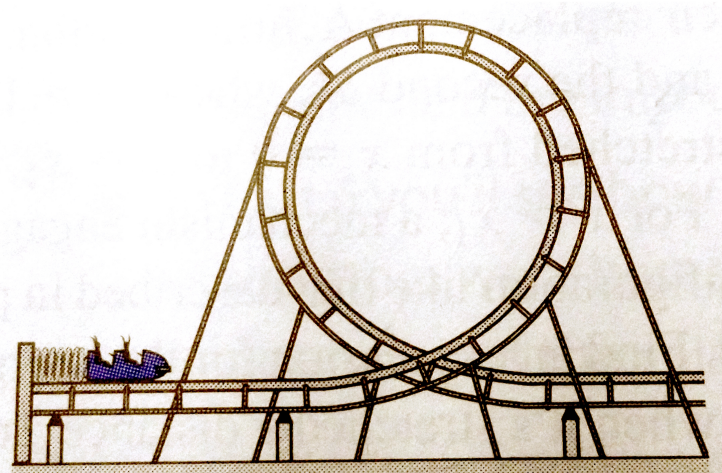
## PHY151 Practice Problems Week 7

### Question 1

- (a) Derive an expression for the potential energy of an object subject to a force  $F_x = ax - bx^3$ , where  $a = 5 \text{ N/m}$  and  $b = 2 \text{ N/m}^3$ , taking  $U = 0$  at  $x = 0$ .
- (b) What are the turning points in the region  $x > 0$  for an object whose total energy is  $-1 \text{ J}$ ? The answer can be found graphically or analytically.

### Question 2

An 840-kg roller coaster car is launched from a giant spring with  $k = 31 \text{ kN/m}$  into a frictionless circular loop with a radius of 6.2 m. What's the minimum spring compression that will ensure the car stays on the track?



### Question 3

A spring of constant  $k = 340 \text{ N/m}$  is used to launch a 1.5-kg block along a horizontal surface whose coefficient of sliding friction is 0.27. If the spring is compressed 18 cm, how far does the block slide?