Practice Exam	Bilkent University	1:	Name: _____
Spring 2010	Phys 101	2:	90 minutes
		3:	
		$\Sigma =$	

In all of your answers, make the necessary substitutions so that your results are simplified as much as possible!

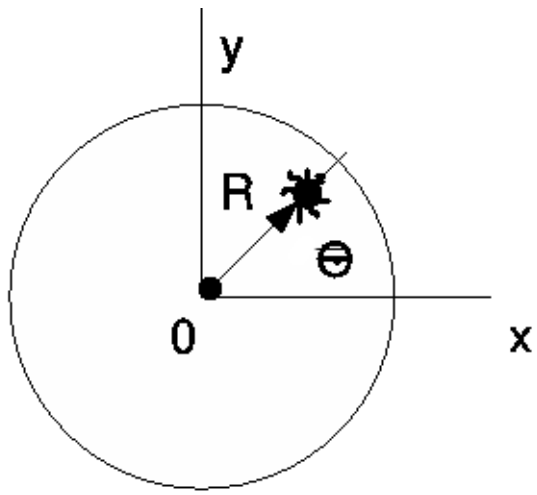

Figure 1: Problem 1

1. (35 points) An insect is walking outwards on a radius of a disk that is rotating with constant speed. Because of the rotation, the the radius makes an angle θ with the x-axis such that $\theta(t) = \omega t$, where ω is a constant and t is the time. The distance of the insect from the center is given by $R(t) = \alpha t$ where α is another constant.

(a) What are the units of ω and α?

(b) What is the position vector of the insect at time t?

(c) What is the velocity of the insect at time t?

(d) What is the aceleration of the insect at time t?

2. (35 points) Atilla is traveling on a train which is moving at 10m/s. Cemal is initially at rest, but then starts running after the train with a constant acceleration of $g/2$, where $g = 10\text{m/s}^2$. Just when Cemal starts running, Atilla is 10m away, and at that instant Atilla throws a ball in the direction of Cemal, at an angle 45° with respect to the train.

(a) With what initial speed must Atilla throw the ball so that it will hit Cemal?

(b) For how much time does the ball fly?

(c) In which direction is the ball moving with respect to ground?

(d) How fast is Cemal running when he catches the ball?

3. (30 points) A small body moves along the x axis with constant acceleration according to the equation

$$\frac{dx}{dt} = cx^p,$$

where c and p are constants.
Show that the acceleration of the body is

$$a = \frac{1}{2}\,c^2.$$