Physics 180

Problem Set # 2: **Due: September 24th**

"No one can make you feel inferior without your permission."
-Eleanor Roosevelt (1884-1962)

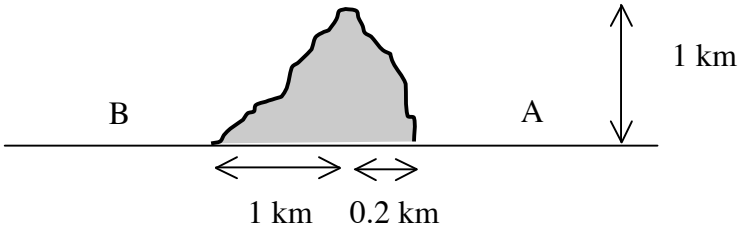
(mks units throughout)

1) Shawna's walk in polar co-ordinates (r,θ) is described by $r = r_0 \sec(\theta - \theta_0)$ where (r_0,θ_0) is a fixed point. What is the form of her path in Cartesian co-ordinates (x,y) and what is the y-axis intercept? What is the significance of the fixed point?

2) A proton moves along the path $\vec{r} = \cos(3t)\hat{i} + \sin(3t)\hat{j} + 6t^2\hat{k}$. What is the common name given to this path? How far is the proton from $\vec{r}_0 = -\vec{i} + 2\vec{j}$ at t = 1.5 s? What angle do the position and acceleration vectors make at that time? What is the minimum speed of the proton?

3) Jeremy launches several balls into the air from ground level at the same speed but at different angles up a hill that is inclined at 15° to the horizontal. The ball that goes the furthest does so in 4.0 s. What is the distance along the hill traveled by the ball that takes 3.0 s?

4) An island has topography shown in the figure. How close to the shoreline must a ship (A) be located if it is to be safe from a ship (B) somewhere on the other side of the island and which has guns with a muzzle speed of 0.3 km/sec?



Practice problems:

ch. 2: 15, 20, 25, 40, 53, 60
ch. 3: 17, 25, 35, 54, 58, 61,62
ch. 4: 3, 6, 7, 13, 18, 23