Static Equilibrium and Rotational Dynamics

1. What is $\beta_{\text{max}}$?

2. A bullet (negligible size) hits the pendulum at the center of mass of the sphere. After collision, bullet and pendulum start to rotate about point $P$.

What is the maximum angle at which the pendulum + bullet will rotate?

The pendulum is composed of a massless string attached to a sphere of mass $m$ and radius $R$. The mass of the bullet is also $m$ and has an initial linear velocity $V_i$. 

$\text{Vib}$
3) Repeat 2 with

4) Repeat 2 with

5) Repeat 2 with