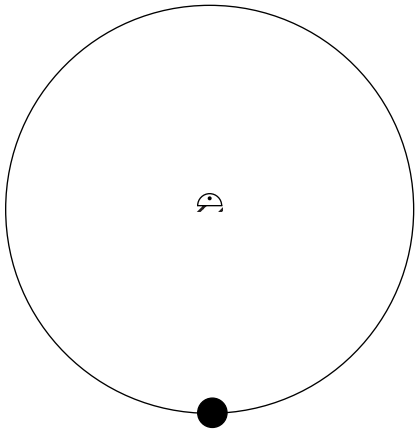
ME 460/660 Exam 1, Fall 1994

1) The damping ratio, ζ, and natural frequency, ω_n, of a single degree of freedom (SDOF) system are identified by examination of the free response to be 0.01 and 10 rad/sec. The spring stiffness is found to be 10 N/m by static analysis. If 1 kg is added to the SDOF system, what arethe new natural frequency and damping ratio? What are the final damping coefficient and mass? Use correct units.

2) A cylinder of mass m and mass moment of inertia $1/2mr^2$ is free to roll without slipping but is restrained by a spring, k, and damper, c, as shown below. Determine the damping ratio and the natural frequency.

3) Determine the equation of motion for the system below. The disk is solid with mass m and the point mass attached to the disk also hass mass m. The disk is pinned at the center so that it can rotate freely.



4) A piece of equipment weighing 10 kg is subject to a base excitation of 10 N with a frequency of 10 rad/sec. Using the figures below, choose a spring stiffness and damping coefficient that will minimize displacement and force transmissibility. Justify (explain) your solution.

5) Find the amplitude of the force transmitted to the ground for the following system assuming a harmonic excitation.