

PHYSICS 180

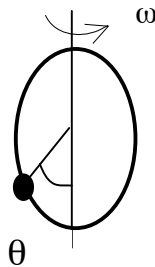
Problem set #5

Due: 5 PM, Monday, Oct. 22, 2007

"Common sense is the accumulation of prejudices acquired by age 18."

A. Einstein (1879-1955)

- 1) Alice stands on top of a platform that moves vertically up and down as $y = A \sin \omega t$ with a "travel" of $2A = 0.5 \text{ m}$. What is the shortest period for which she can stay in contact with the platform at all times?
- 2) i) The bead in the figure can slide without friction on a circular loop of radius R . The loop is rotated with constant angular velocity, ω , about a vertical axis. Find the angle θ , such that the bead does not slide up or down.



- ii) A bucket containing water is swung by Steve in a vertical circle so that the surface of the water is 1.5 m from the center of rotation. What is the minimum angular velocity required so as not to spill the water?
- 3) i) A 0.5 kg ball is thrown vertically into air by Dan with an initial velocity of 10 m/s . If there is a resistive force $F = -bv$, where $b = 0.1 \text{ N s/m}$ and v is the velocity, after what time does it reach its maximum height and how does this compare with the answer you get if there is no resistive force?
ii) What is the velocity of the ball when Dan catches it as it returns to the height from which it was thrown?
- 4) i) Jack throws a 0.5 kg ball into the air with an initial speed of 20 m/s at an angle of 45° with respect to the horizontal. If air resistance is neglected, what is the work done by gravity on the ball in the first second of flight?
ii) Consider problem #3 from problem set #4. What work is done by friction and by the spring on Catherine from the time she hits the spring until the spring reaches its maximum compression?

Practice Problems:

Ch. 6: 8, 11, 14, 19, 22, 25, 27, 33, 43, 50, 56

Ch. 7: 7, 16, 18, 25, 28