

Name _____ Section _____



Ho Ho Ho



ES204
Examination I
December 17, 2004

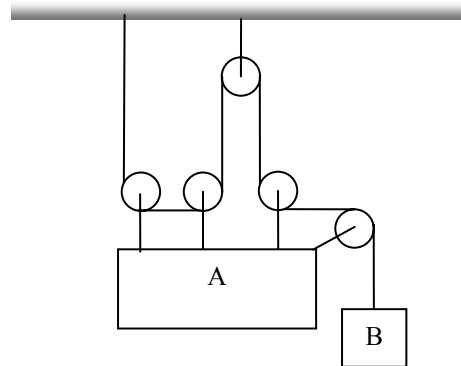
Problem	Score
1	/30
2	/45
3	/25
Total	/100

Show all work for credit
AND
Turn in your signed help sheet
AND
Stay in your seat until the end of class

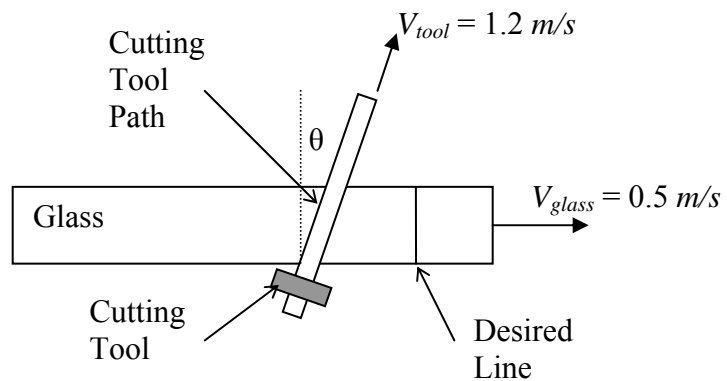


 **Merry Christmas! Frohe Weihnachten!** 

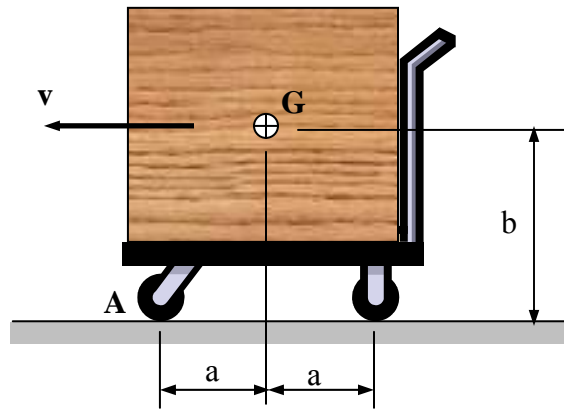
1.1) Determine the correct kinematic relationship for the velocities of blocks A and B in the system shown. (10 pts)



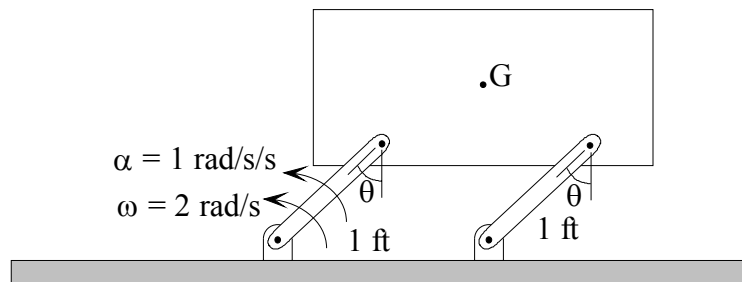
1.2) A long sheet of glass moves along a conveyer belt as shown at right. The cutting tool moves along the cutting tool path to score the glass. What cutting tool path angle θ is required for the cutting tool to score the desired straight line on the glass? (10 pts)



1.3) A large wooden crate of mass, m , is being moved with a constant speed, v , on a dolly as shown. The center of gravity of the crate is located at point G . What is the angular momentum of the crate about point A ? (5 pts)



1.4) A rectangular plate swings from arms of equal length as shown below. Determine the angular velocity of the plate. (5 pts)



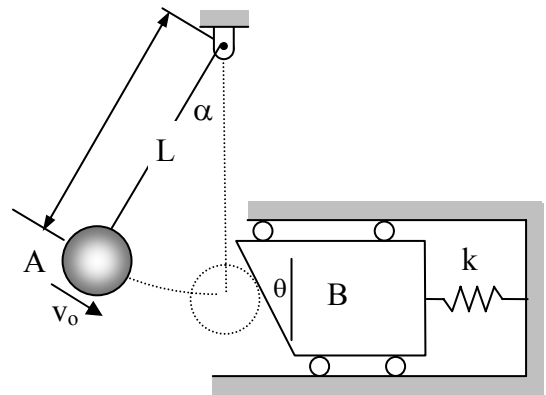
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Problem 2

45 pts
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When the rope is at an angle, α , sphere A has a velocity, v_0 . Assuming the mass of A, m_A , the mass of B, m_B , the coefficient of restitution, e , the length of cable, L , the spring constant, k , and the angles, α and θ are all known, determine the equations necessary to determine

- The tension in the rope at the angle α that is, in the position shown
- The velocity of A and B after the impact
- The impulse acting on the rope during the impact.



DO NOT SOLVE THE RESULTING EQUATIONS!

Your solution should consist of a table of unknowns and equations and a number collection of equations. Be sure to clearly document your solution.

Unknowns	Equation Number

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Problem 3

25 pts
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A spider is crawling towards the center of a rotating fan at a constant speed of 0.1 m/s relative to the fan. The fan is rotating at a constant 2 rad/s . The spider is a rare jumping spider that can take off with a speed of 1 m/s when standing still.

- At the instant shown what is the velocity and acceleration of the spider
- If the spider wants to jump onto the light (for some reason it wants to kill itself) then what direction should the spider jump? Assume the spider leaves the fan with a horizontal velocity and the speed of the spider relative to the fan is 1 m/s .

