

# MECH 211-1

Spring 2009, Prof. Yakobson

## Test 1

Due in class 10 am Monday Feb 16, 2009

Show all work. Any force existing in an equation must also be denoted on an appropriate free body diagram. Clearly indicate (box) final answers.

This test is taken under the Rice Honor Code system. You may consult only the textbook (Bedford and Fowler), and notes that you have personally taken, or classnotes-materials downloaded from the course website. You may use a calculator, including programmable calculators. The test must be taken during a contiguous 3 hour period, with an optional 30 minutes break.

At the conclusion of the test, fold all sheets in half with your name (above) clearly visible, and seal them (staple or tape).

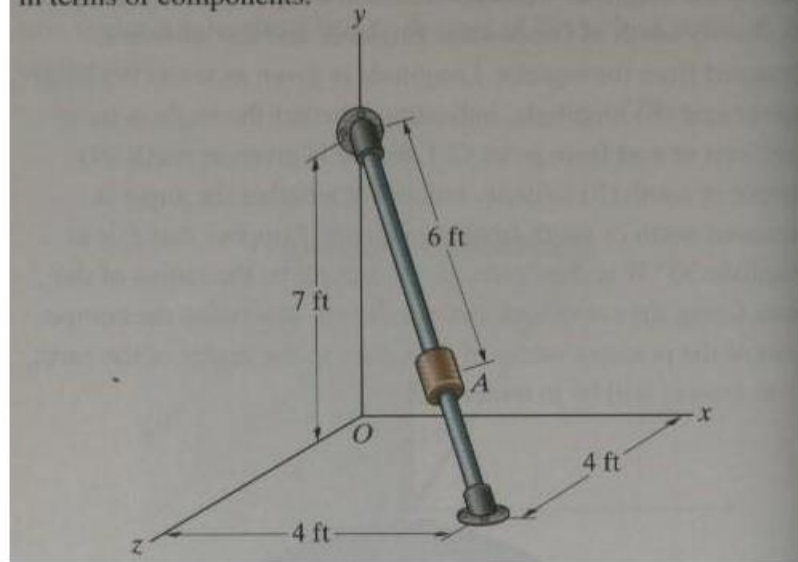
**Time started:** \_\_\_\_\_.

**Time finished:** \_\_\_\_\_.

**Pledge/signature:** \_\_\_\_\_.

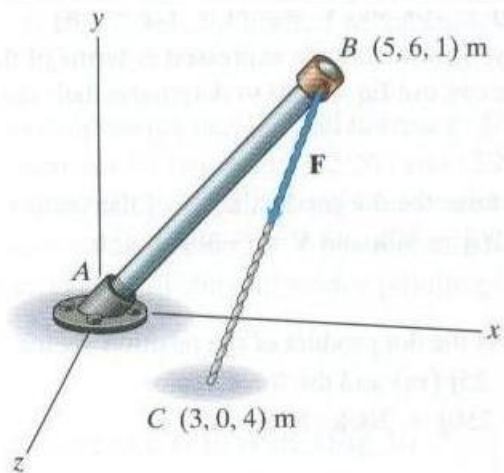
### Problem 1

Express the position vector from point  $O$  to the collar at  $A$  in terms of components.



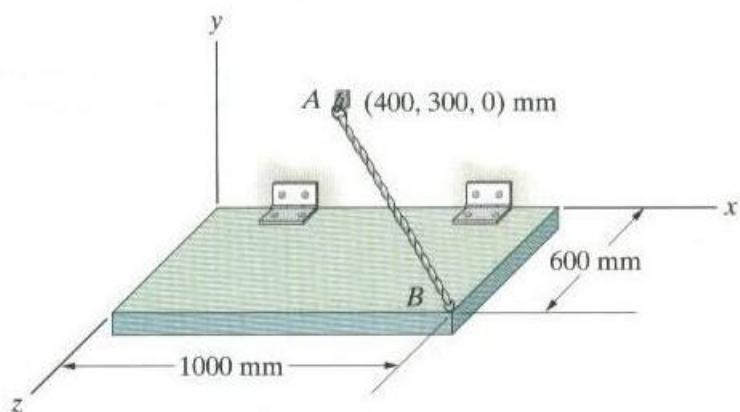
### Problem 2

The cable  $BC$  exerts an 800-N force  $\mathbf{F}$  on the bar  $AB$  at  $B$ . Use Eq. (2.26) to determine the vector component of  $\mathbf{F}$  parallel to the bar.



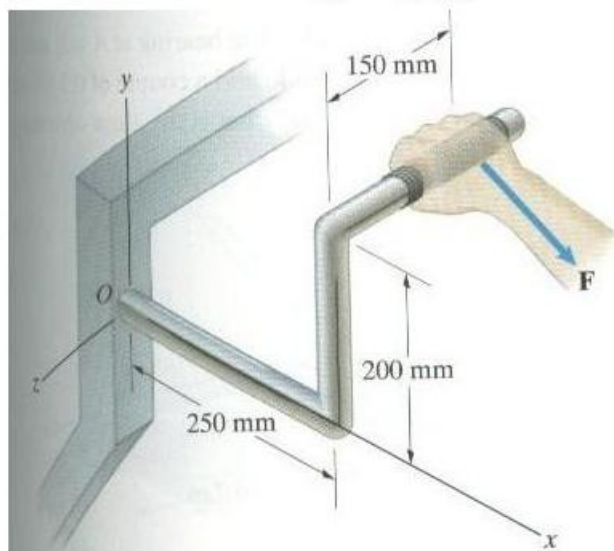
### Problem 3

The tension in the cable  $AB$  is 1 kN. Determine the moment about the  $x$  axis due to the force exerted on the hatch by the cable at point  $B$ . Draw a sketch to indicate the direction of the moment.



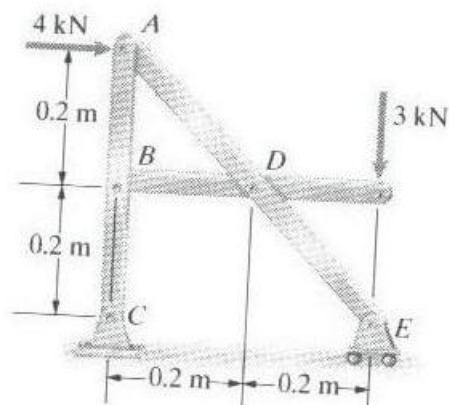
### Problem 4

The force exerted on the grip of the exercise machine is  $\mathbf{F} = 260\mathbf{i} - 130\mathbf{j}$  (N). What are the reactions at the built-in support at  $O$ ?



### Problem 5

Determine the reactions on member  $ABC$  at  $B$  and  $C$ .



### Problem 6

The 5-kg box is at rest on the sloping surface. The  $y$  axis points upward. The unit vector  $0.557\mathbf{i} + 0.743\mathbf{j} + 0.371\mathbf{k}$  is perpendicular to the sloping surface. What is the magnitude of the friction force exerted on the box by the surface?

