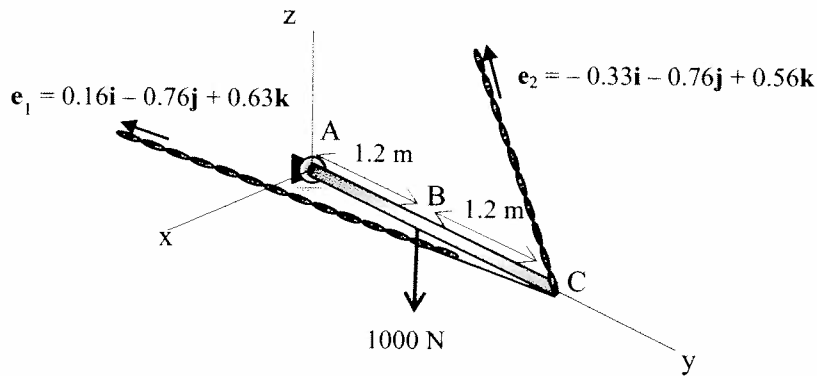
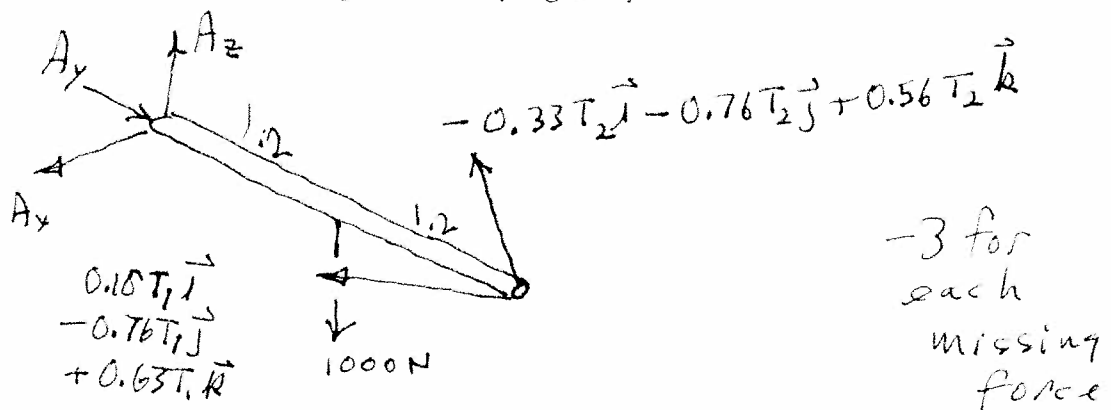


Problem 3 (30 points)

A massless beam is supported by a ball and socket type joint at A and chains attached at Point C. The unit vectors specifying direction from C to the chains' anchor points are given in the figure. A vertical load of 1000 N is applied at point B. You are assigned to find the reactions at A and the tensions in the two chains.



(a) Draw a free body diagram that is appropriate for analyzing this system.



(b) Write the three component equations resulting from the application of force equilibrium to your free body diagram. Do not solve the equations!

$$\sum F_x = 0 \quad A_x + 0.16 T_1 - 0.33 T_2 = 0$$

$$\sum F_y = 0 \quad A_y - 0.76 T_1 - 0.76 T_2 = 0$$

$$\sum F_z = 0 \quad A_z + 0.63 T_1 + 0.56 T_2 - 1000 = 0$$

Failure to parse components of T_2 -6
 Failure to use symbols for tensions used unit vectors just -3
 Forgot a load or a force -3
 Forgot several -6

(c) Write the three component equations resulting from the application of moment equilibrium to your free body diagram. You are taking moments about point C. Do not solve the equations!

$\Sigma M_x = 0$	$1200 + 2.4 A_z = 0$	$(-1.2\vec{j}) \times (-1000\vec{k})$ $+ (-2.4\vec{j}) \times (A_x\vec{i} + A_y\vec{j} + A_z\vec{k})$
$\Sigma M_y = 0$	$0 = 0$	
$\Sigma M_z = 0$	$-2.4 A_x = 0$	

About point A

$\Sigma M_x = 0$	$1.512T_1 + 1.344T_2 - 1200 = 0$	$(2.4\vec{j}) \times (0.16T_1\vec{i} - 0.76T_2\vec{j} + 0.63T_1\vec{k})$ $+ (2.4\vec{j}) \times (-0.73T_2\vec{i} - 0.76T_2\vec{j} + 0.56T_2\vec{k})$ $+ (1.2\vec{j}) \times (-1000\vec{k})$
$\Sigma M_y = 0$	$0 = 0$	
$\Sigma M_z = 0$	$-0.384T_1 + 0.792T_2 = 0$	

About point B (shudder!)

$\Sigma M_x = 0$	$-1.2 A_z + 0.1756T_1 + 0.672T_2 = 0$	$(1.2\vec{j}) \times (0.16T_1\vec{i} - 0.76T_2\vec{j} + 0.63T_1\vec{k})$ $+ (1.2\vec{j}) \times (-0.33T_2\vec{i} - 0.76T_2\vec{j} + 0.56T_2\vec{k})$ $+ (-1.2\vec{j}) \times (A_x\vec{i} + A_y\vec{j} + A_z\vec{k})$
$\Sigma M_y = 0$	$0 = 0$	
$\Sigma M_z = 0$	$1.2 A_x - 0.192T_1 + 0.386T_2 = 0$	

Sets up cross products and/or produces correct equations 10

Set up cross products ok - not carried out 8

Set up cross products incorrectly but not too bad - some mistakes 6 or 4

Has no idea, tried to take moments may recognize a term 2