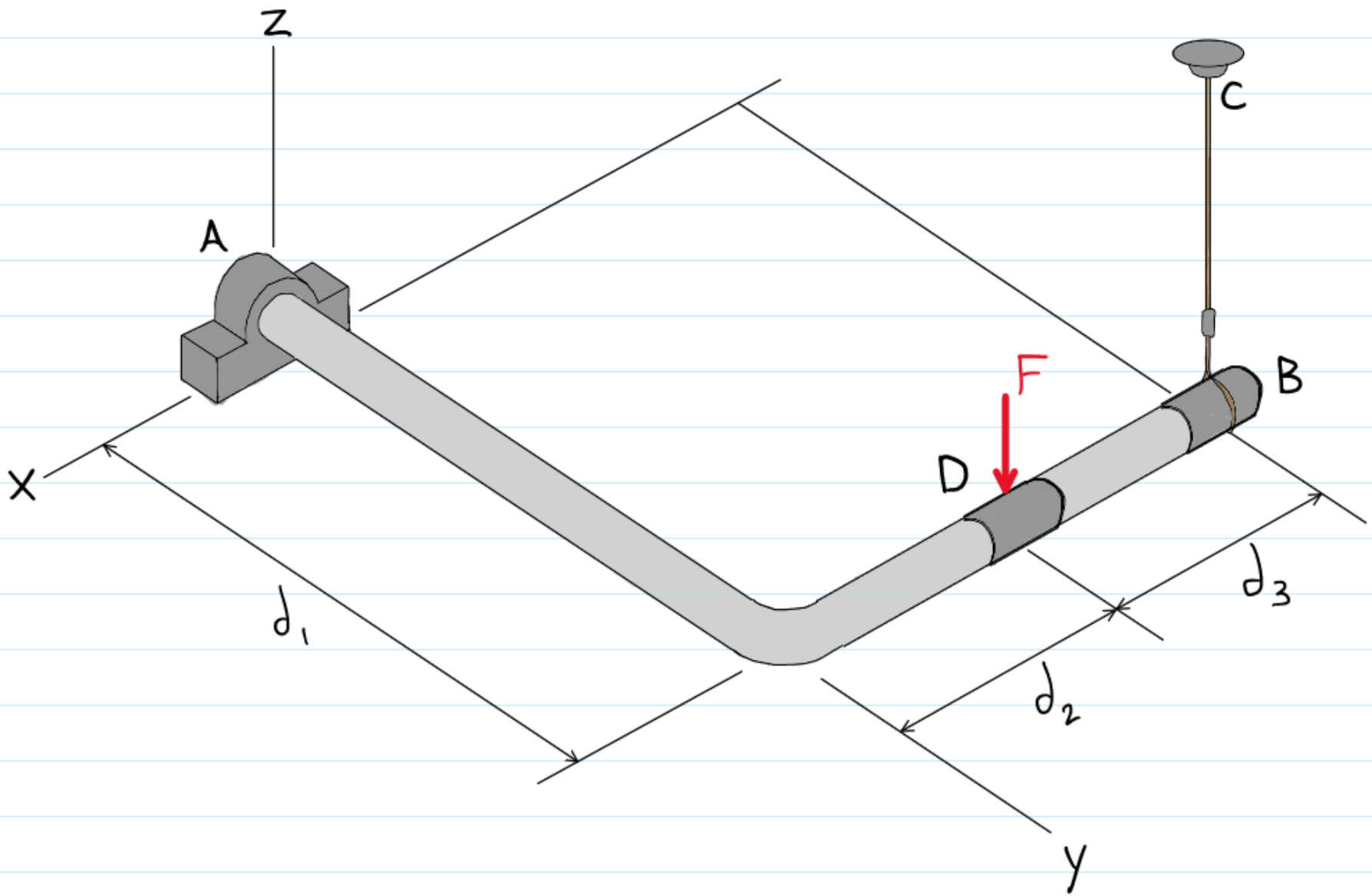
21-5-5-7-GD-001

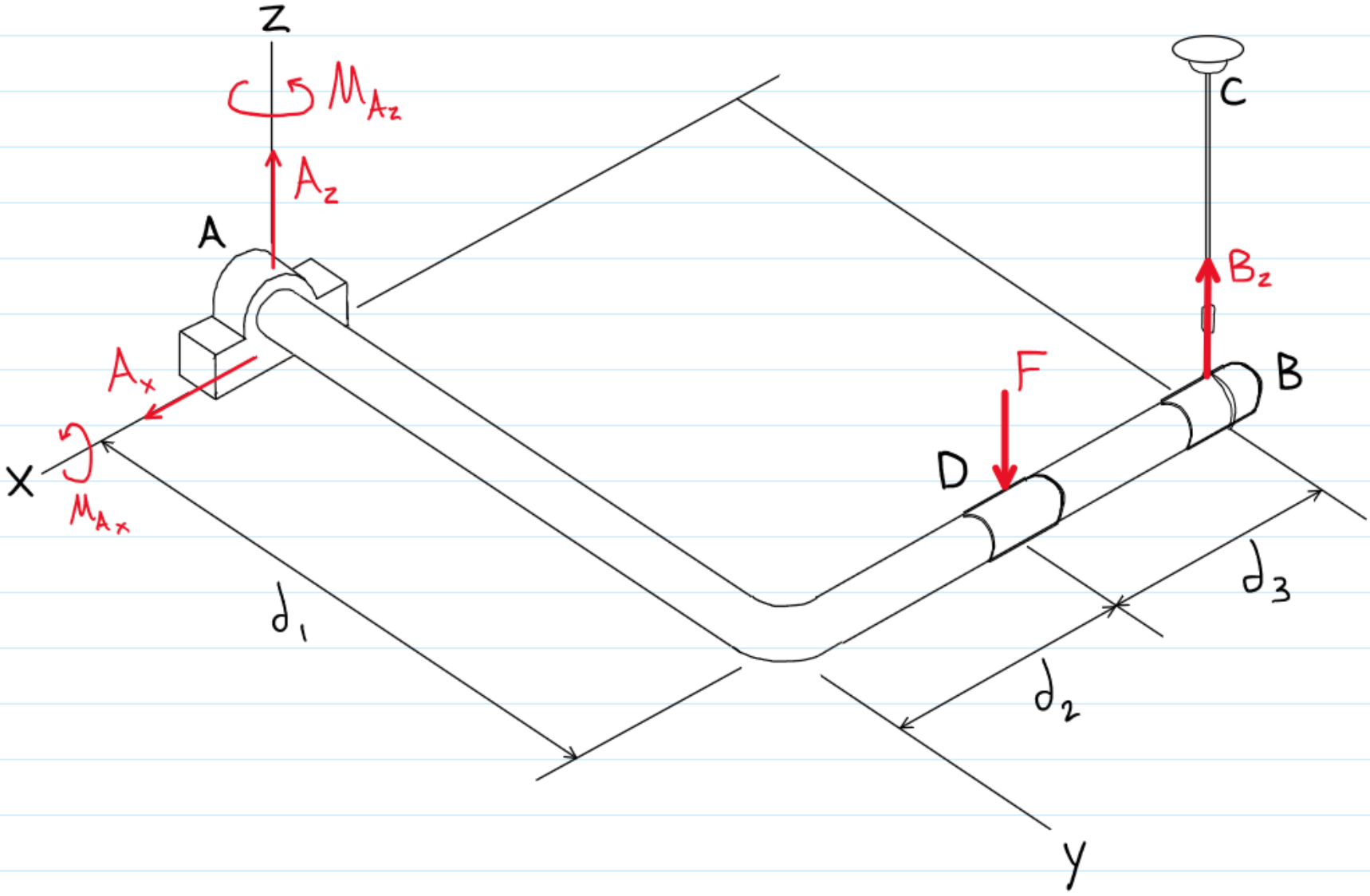


A rod is held in equilibrium by a thrust bearing at A and a cable at B. Select the unknown reactions at A and B that must be included in the FBD and determine their values.

given F, d_1, d_2, d_3

find $A_x, A_z, M_{Az}, M_{Ax}, B_z$

FBD



Thrust bearings only produce 2 reaction forces and 2 reaction moments, while cable BC provides only 1 tensile reaction.

Equations of Equilibrium

$\Sigma F_x = 0 = A_x$

$\Sigma F_y = 0 = 0$

(1) $\Sigma F_z = 0 = A_z + B_z - F$

(2) $+\circlearrowleft \Sigma (M_x)_A = 0 = M_{Ax} + B_z(d_1) - F(d_1)$

(3) $+\circlearrowleft \Sigma (M_y)_A = 0 = B_z(d_2 + d_3) - F(d_2)$

$+\circlearrowleft \Sigma (M_z)_A = 0 = M_{Az}$

Use (3) to solve for B_z → Then solve (1) & (2)

$$B_z = \frac{F(d_2)}{(d_2 + d_3)}$$

$A_z = F - B_z$

$M_{Ax} = d_1(F - B_z)$