

Faculty of Engineering and Design
Carleton University
Midterm Examination I - February 2014.

Date: February 9, 2014
Time: 90 minutes

No of Students: 935

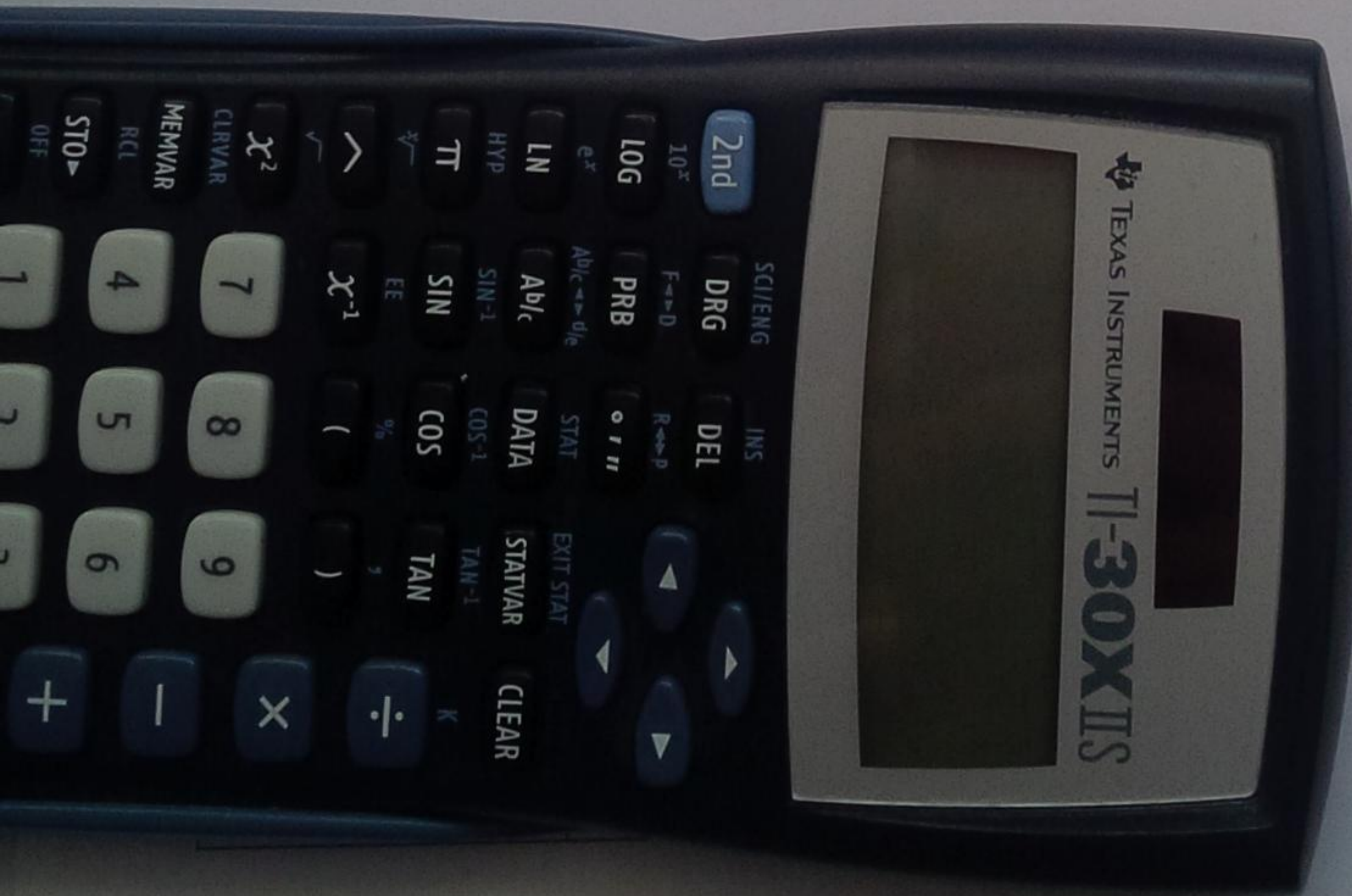
Course: ECOR 1101 Engineering Mechanics: Sections B, C, D, E & F.
Department: Civil and Environmental Engineering
Course Instructors: Professors Salinas, Sarkar, Sivathayalan, and Vandenberg

Authorized Memoranda

Calculator ONLY.
(Programmable calculators permitted).
(Handheld computers, Cellphones, Smartphones etc. not permitted)

Instructions:

1. Write your name, student number and place your signature in the space provided below.
2. Circle your lecture section and P/A class section in the table below.
3. This examination has **SIX** pages. Make sure you have all the pages.
4. **Answer ALL Questions.**
5. Answer the questions in the space provided. You can use the facing page, and/or the back of the page if you require additional space. Clearly mark the question number if you make use of this additional space.
6. **This examination is closed book.** You are not allowed to have any unauthorized material on the desk or in your pockets. Your backpacks must be placed at the front of the room, and not next to your seat. (These instructions have been posted ahead of time. So, you should not bring any valuables to the examination room. We are not responsible for lost items).
7. Your answers should be clearly presented, and you should provide appropriate intermediate steps.

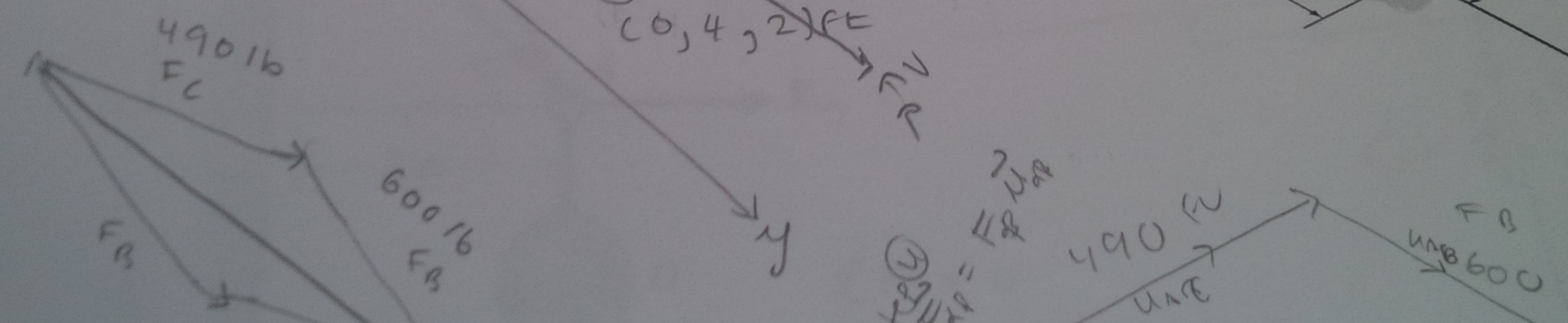
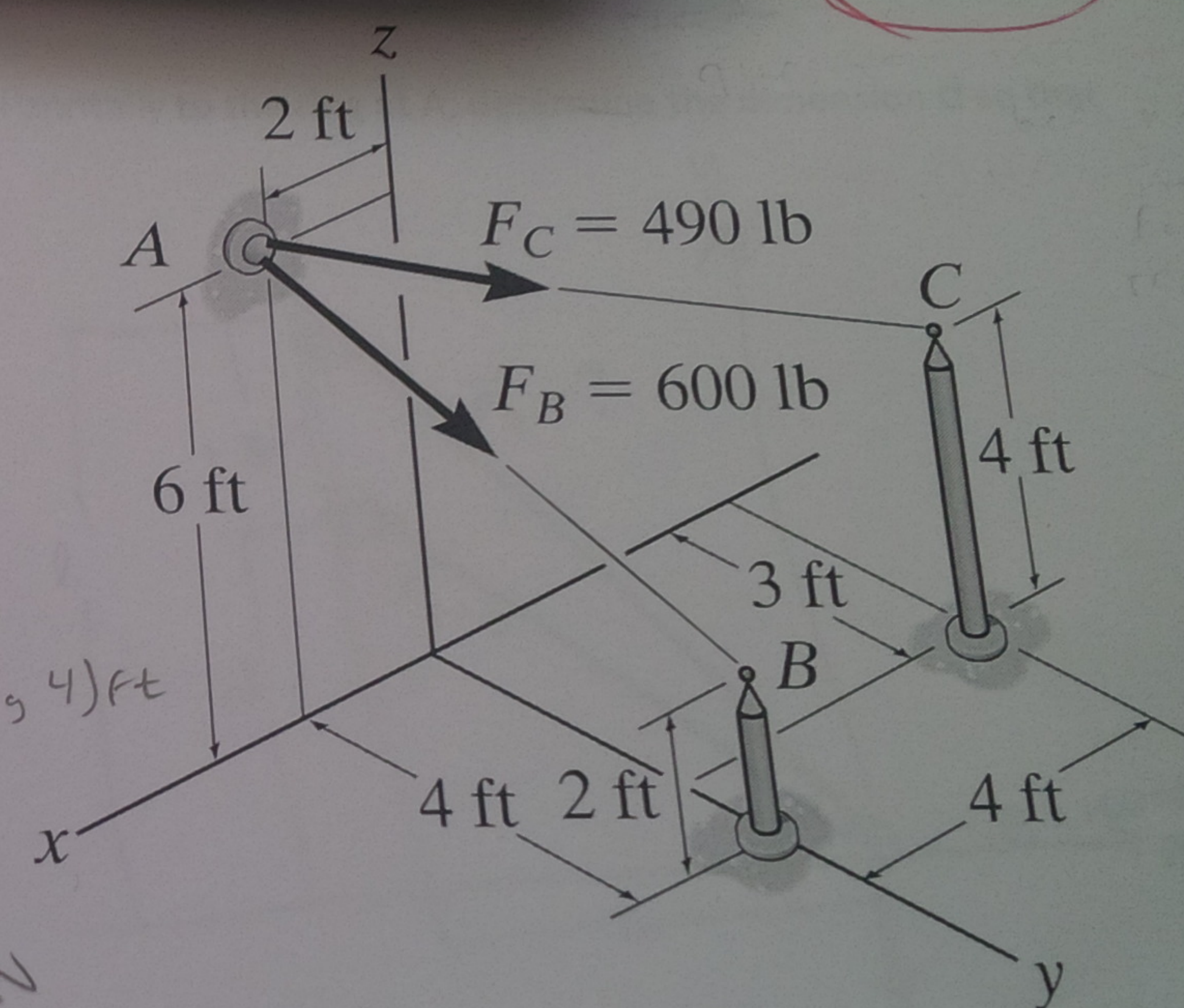
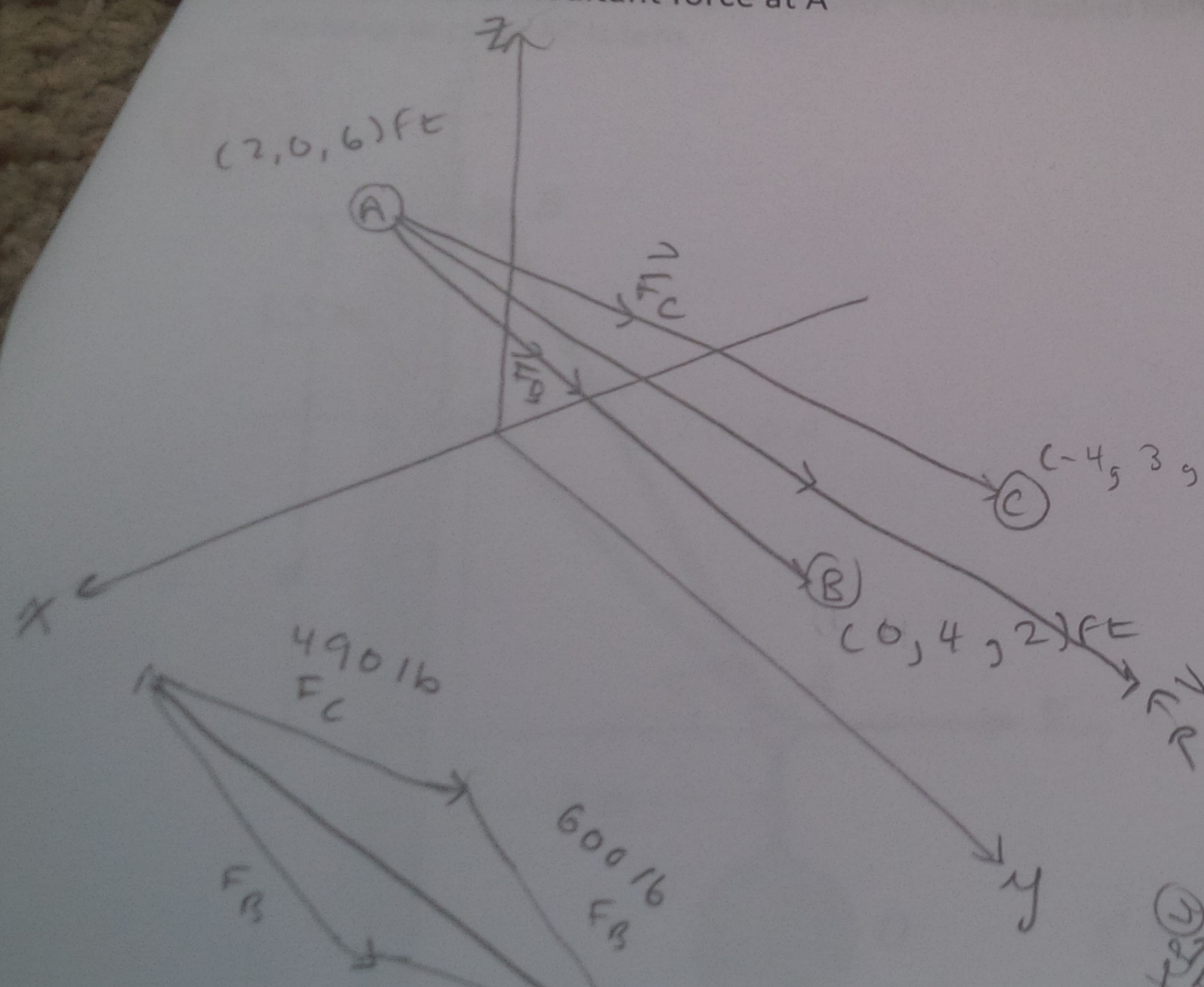


For Instructor Use ONLY		
Question	Max Mark	Your Mark
Q1	20	20
Q2	20	20
Q3	20	20
Total		60



20

Q1.
Determine the resultant force at A

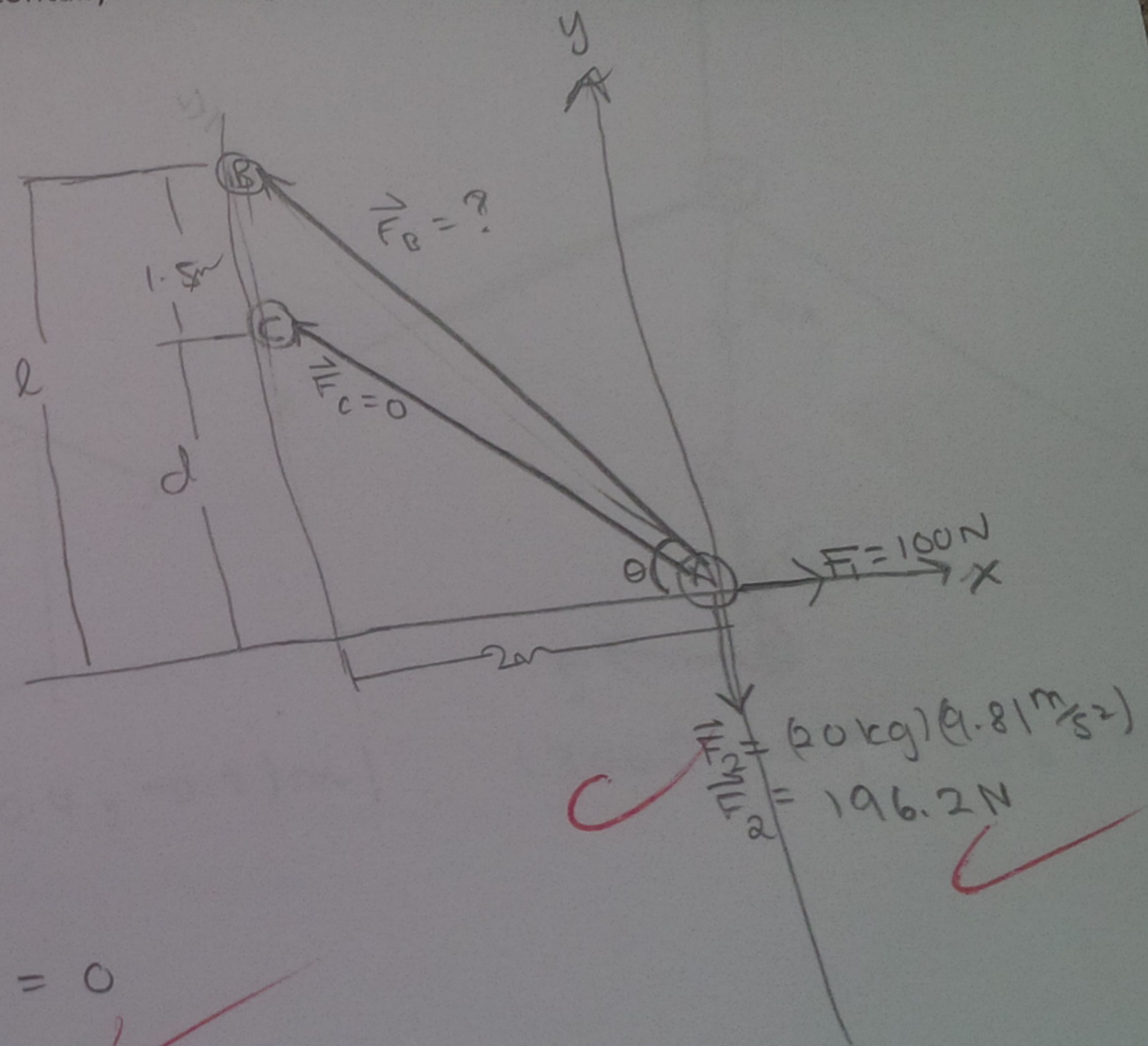
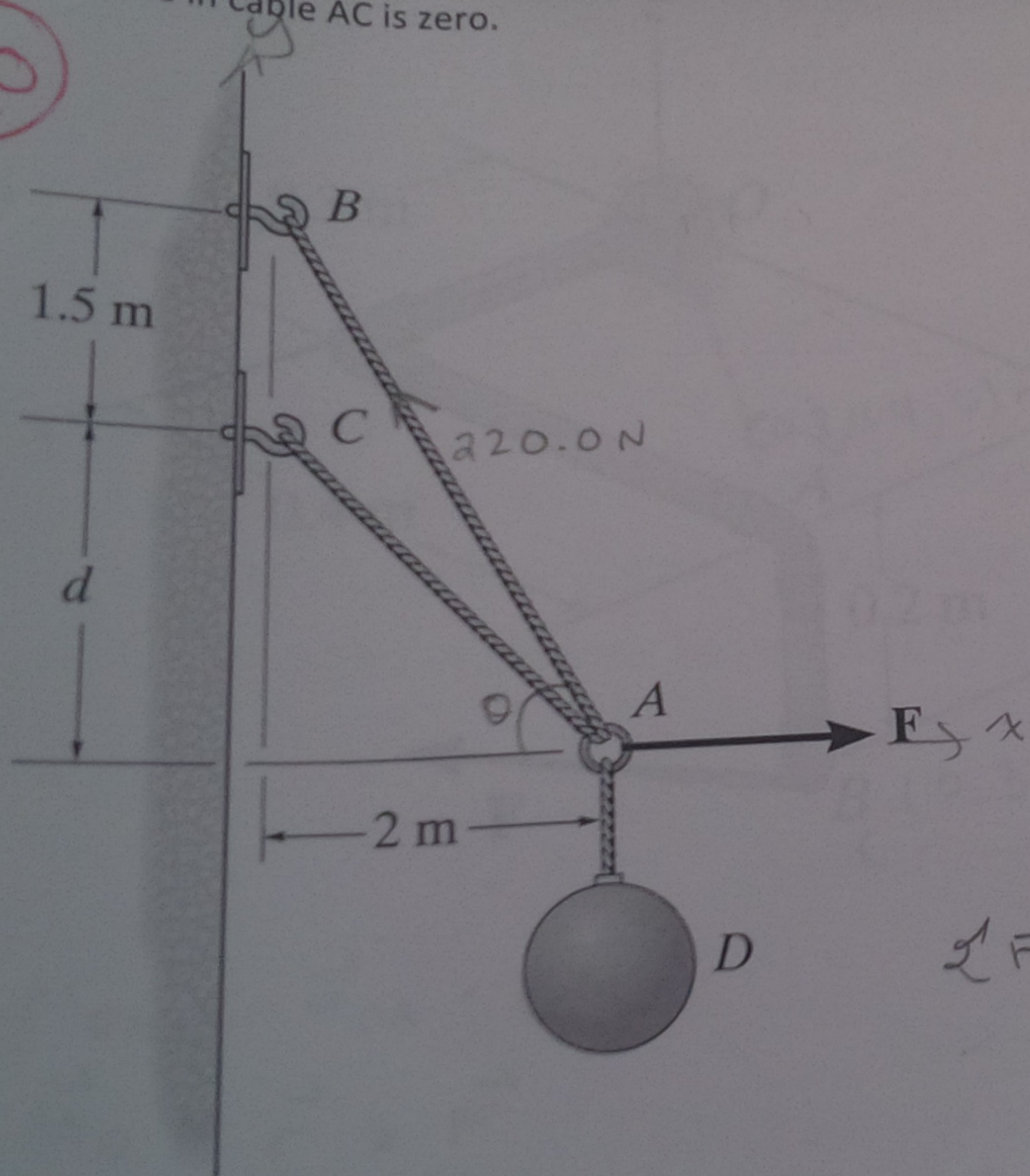


$\vec{r}_{AC} = 2\hat{i} + 3\hat{j} + 2\hat{k}$
 $\vec{r}_{AB} = -2\hat{i} + 4\hat{j} - 4\hat{k}$
 $F_C = 490 \frac{\vec{r}_{AC}}{|\vec{r}_{AC}|}$
 $F_B = 600 \frac{\vec{r}_{AB}}{|\vec{r}_{AB}|}$

Q2.

The ball D has a mass of 20 kg. If a force $F = 100\text{N}$ is applied horizontally to the ring at A, determine the dimension d so that the force in cable AC is zero.

20

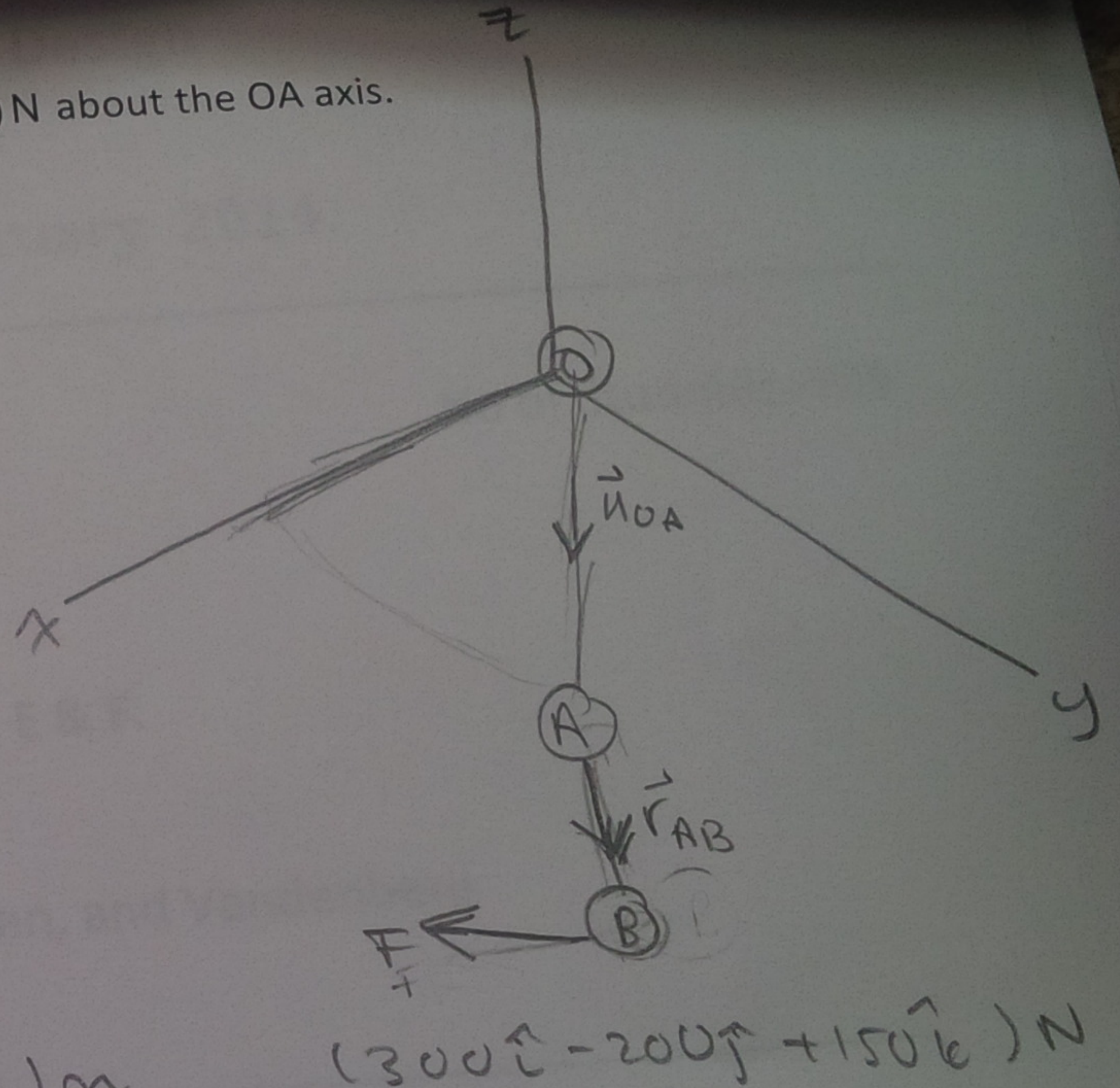
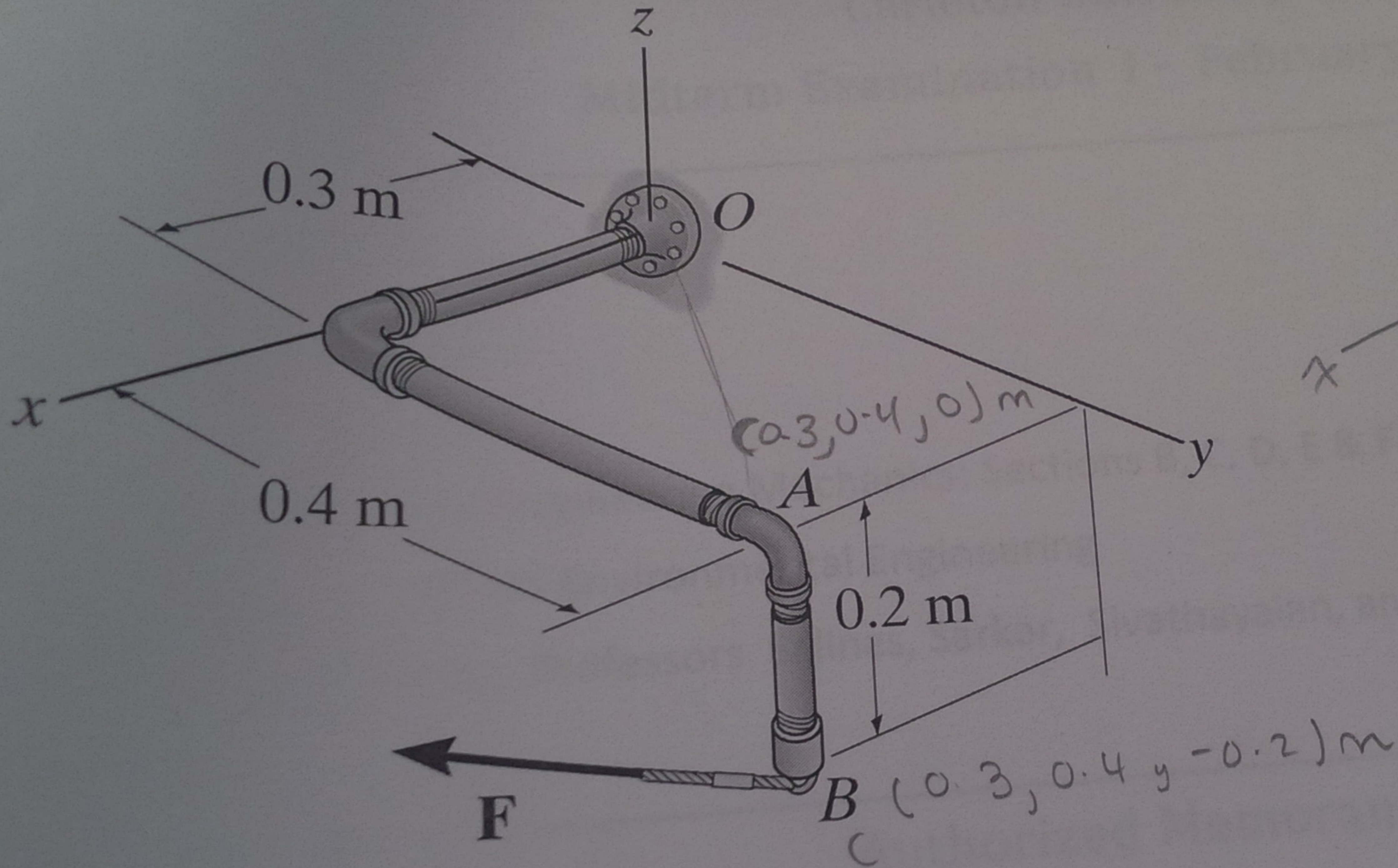


$\sum F = 0$

the opposite of $F_1 (100\hat{i}\text{N})$ and $F_2 (196.2\hat{j}\text{N})$ in order for equilibrium to occur.

Q3.

Determine the magnitude of the moment of the force $\vec{F} = (300\hat{i} - 200\hat{j} + 150\hat{k})\text{ N}$ about the OA axis.



$$M_{OA} = \vec{u}_{OA} \cdot (\vec{M}_O)$$

$$\vec{M}_O = \vec{r} \times \vec{F}$$

... for axis to line of action \therefore ~~from~~ A \rightarrow B will work.