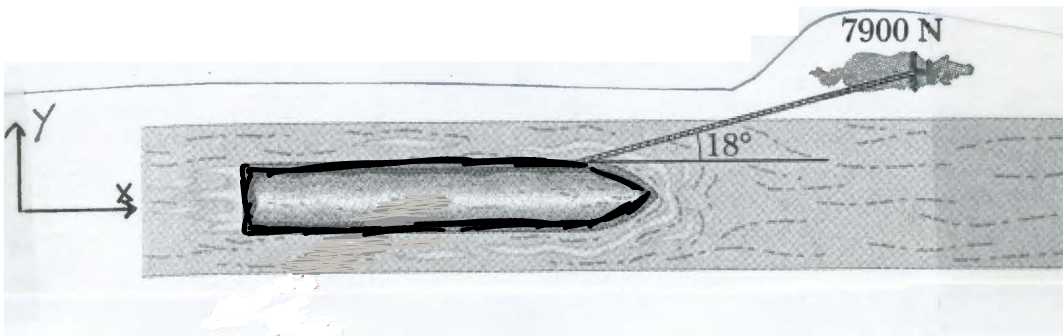


5. (25 pts.) In canals, such as those used around Easton in the mid 19th century, a mule pulled a barge along a canal in the manner shown in the figure. Suppose that the mule pulls on the rope with a force of 7900 N at an angle of 18° to the direction of motion of the barge, which is headed straight along the canal. The mass of the barge is 9500 kg, and its acceleration is observed to be 0.12 m/s^2 .

- a. (10 pts.) What is the x -component of the force exerted by the water on the barge? (Take the x -direction to be to the right, in the direction of motion of the barge.)

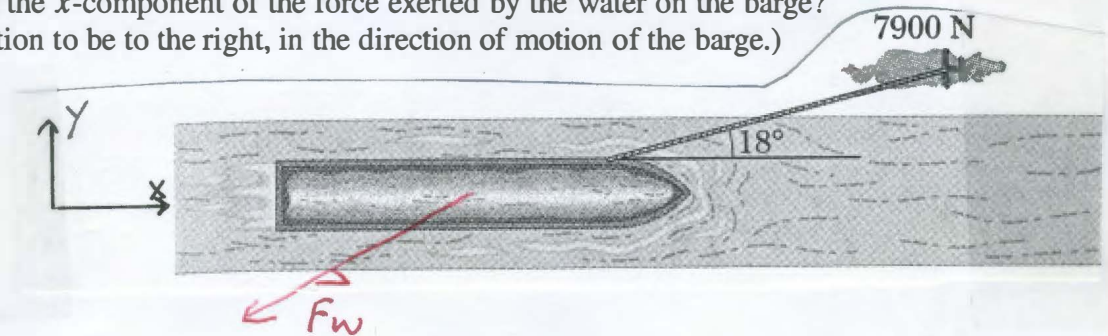


- b. (10 pts.) What is the y -component of the force exerted by the water on the barge?

- c. (5 pts.) What is the direction of the force on the barge from the water? Express your answer in degrees away from the positive x -axis (the usual convention used in class).

5. (25 pts.) In canals, such as those used around Easton in the mid 19th century, a mule pulled a barge along a canal in the manner shown in the figure. Suppose that the mule pulls on the rope with a force of 7900 N at an angle of 18° to the direction of motion of the barge, which is headed straight along the canal. The mass of the barge is 9500 kg, and its acceleration is observed to be 0.12 m/s^2 .

- a. (10 pts.) What is the x -component of the force exerted by the water on the barge? (Take the x -direction to be to the right, in the direction of motion of the barge.)



$$\begin{aligned}\Sigma F_x &= ma_x \\ 7900 \cos 18^\circ + F_{wx} &= (9500)(0.12) \\ F_{wx} &= -6373 \text{ N}\end{aligned}$$

- b. (10 pts.) What is the y -component of the force exerted by the water on the barge?

$$\begin{aligned}\Sigma F_y &= ma_y \\ 7900 \sin 18^\circ + F_{wy} &= 0 \\ F_{wy} &= -2441\end{aligned}$$

- c. (5 pts.) What is the direction of the force on the barge from the water? Express your answer in degrees away from the positive x -axis (the usual convention used in class).

$$\vec{F}_w = 6825 \text{ N @ } -159^\circ \text{ (or } +201^\circ),$$

roughly as shown in the figure.