

- 11 In this question the unit vectors \mathbf{i} and \mathbf{j} are in the directions east and north respectively.

Distance is measured in metres and time in seconds.

A ship of mass 100 000 kg is being towed by two tug boats.

- The cables attaching each tug to the ship are horizontal.
- One tug produces a force of $(350\mathbf{i} + 400\mathbf{j})$ N.
- The other tug produces a force of $(250\mathbf{i} - 400\mathbf{j})$ N.
- The total resistance to motion is 200 N.
- At the instant when the tugs begin to tow the ship, it is moving east at a speed of 1.5 m s^{-1} .

(a) Explain why the ship continues to move directly east. [2]

(b) Find the acceleration of the ship. [2]

(c) Find the time which the ship takes to move 400 m while it is being towed.

Find its speed after moving that distance. [6]