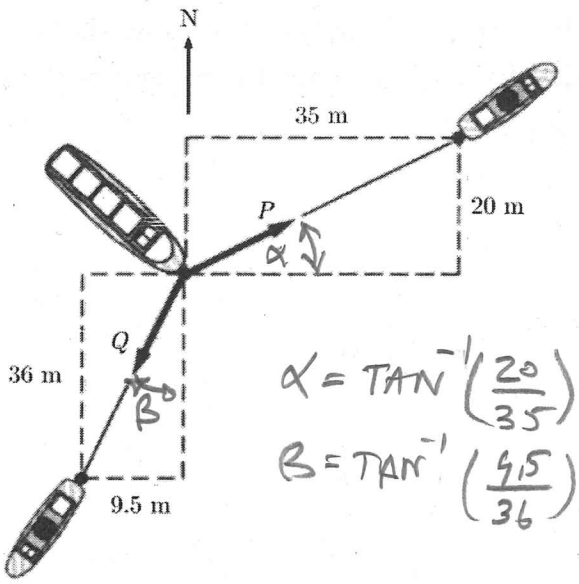
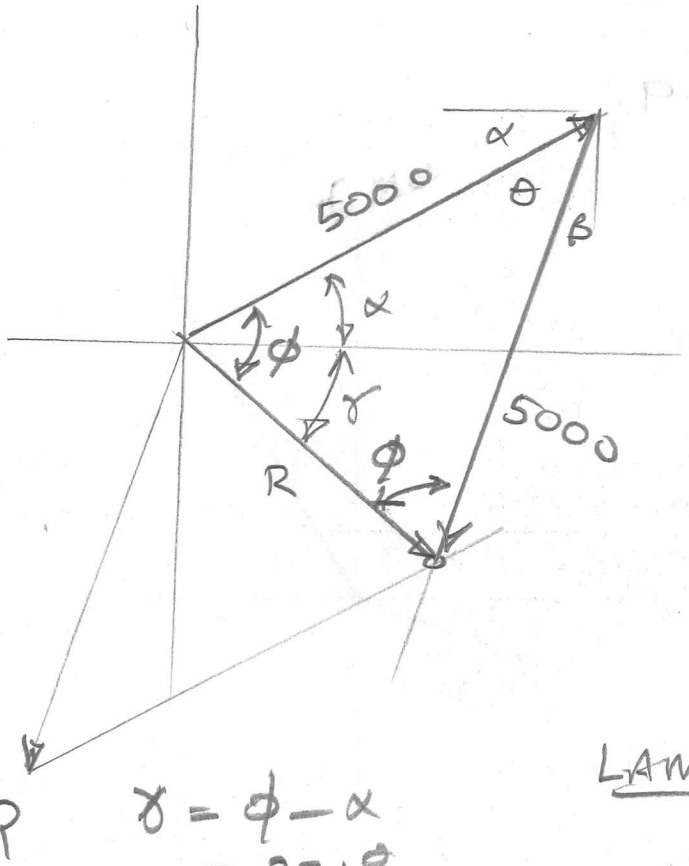
Two tugboats are pulling a ship with 5000 MN forces in the directions shown.

Draw a scaled parallelogram of the forces, then determine the magnitudes and direction of the net force on the ship.



$\alpha = \tan^{-1}\left(\frac{20}{35}\right) = 29.7°$

$\beta = \tan^{-1}\left(\frac{9.5}{36}\right) = 14.8°$



$\theta = 90 - \alpha - \beta$

$= 45.5$

NOTE TRIANGLE IS ISOCELES

$\phi = \frac{180 - \theta}{2} = 67.25°$

$\gamma = \phi - \alpha$

$= 37.6°$

LAW OF SINES

$\frac{5000}{\sin\phi} = \frac{R}{\sin\theta}$

$R = 3867$ MN

$\bar{R} = 3867$ N @ $37.6°$ ▽