

Mechanics I

ECOR 1101

2 problems.
 Closed book.
 Write clearly and neatly.
 All answers in this paper.

Test 1A

Section B (Prof. Isgor)
 Even Student ID
 Wednesday, September 20, 2006
Duration: 60 minutes

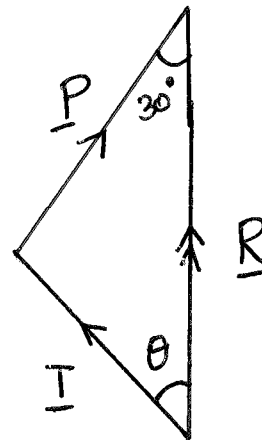
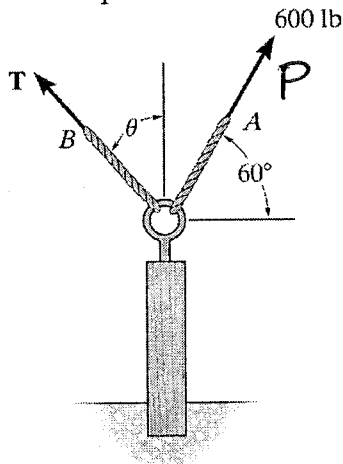
Section:

Name:

Student ID:

Problem 1: (50 marks)

The post is to be pulled out of the ground using 2 ropes A and B. Rope A is subjected to a force of 600 lb and is directed at 60° from the horizontal. If the resultant force acting on the post is to be 1200 lb, vertically upward, determine the force T in rope B and the corresponding angle.



$$|R| = 1200 \text{ lb} \quad , \quad |P| = 600 \text{ lb} \quad |T| = ? \quad \theta = ?$$

cosine Rule

$$|T|^2 = |P|^2 + |R|^2 - 2|P||R|\cos 30$$

$$|T|^2 = 600^2 + 1200^2 - 2 \times 600 \times 1200 \cos 30$$

$$|T| = 743.6 \text{ lb} //$$

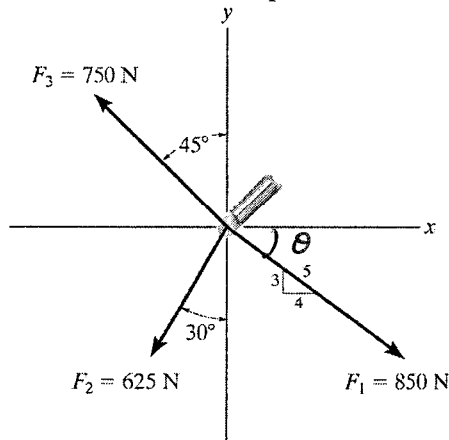
Use Sine Rule

$$\frac{|P|}{\sin \theta} = \frac{|I|}{\sin 30}$$

$$\theta = 23.8^\circ //$$

Problem 2: (50 marks)

Determine the magnitude of the resultant force and its direction, measured counterclockwise from the positive axis.



$$\theta = \tan^{-1}\left(\frac{3}{4}\right)$$

$$\cos \theta = \frac{4}{5} \quad \sin \theta = \frac{3}{5}$$

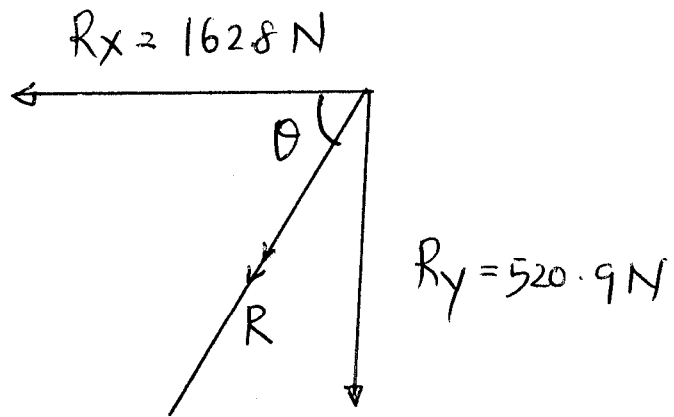
→ Component

$$\begin{aligned} R_x &= F_1 \cos \theta - F_2 \sin 30 - F_3 \sin 45 \\ &= 850 \times \frac{4}{5} - 625 \times \frac{1}{2} - 750 \times \frac{1}{\sqrt{2}} \\ &= -162.8 \text{ N} \end{aligned}$$

↑ Component

$$\begin{aligned} R_y &= -F_1 \sin \theta - F_2 \cos 30 + F_3 \cos 45 \\ &= -850 \times \frac{3}{5} - 625 \cos 30 + 750 \cos 45 \\ &= -520.9 \text{ N} \end{aligned}$$

$$R = \sqrt{R_x^2 + R_y^2} = 545.7 \text{ N} //$$



$$\tan \theta = \frac{R_y}{R_x}$$

$$= \frac{-520.9}{-162.8}$$

$$\theta = 72.6^\circ$$

$$\underline{R} = 545.7 \text{ N}$$

