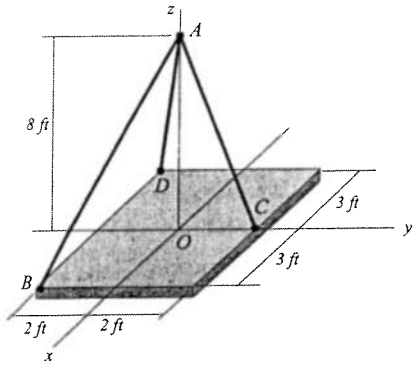
BE 50 Statics FINAL EXAMINATION

Fall Semester 2002

Problem 1 The rectangular platform weighs 1000 lb and is supported by three cables, as shown. The center of gravity of the platform is at point *O*.



(a) Express the three cable forces in vector form.
(b) Solve for the magnitudes of the three cable forces.

(a) $T_B\,(.342\hat{i} - .228\hat{j} - .912\hat{k})$

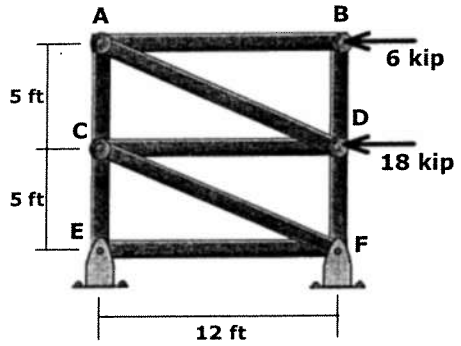
$T_D\,(-.342\hat{i} - .228\hat{j} - .912\hat{k})$

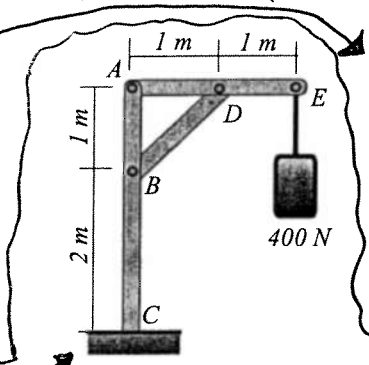
$T_C\,(.243\hat{j} - .970\hat{k})$

(b) $T_C = 514.9$ lb

$T_B = T_D = 274.4$ lb.

Problem 2 Find the force in members CE, CF and AB (below left).



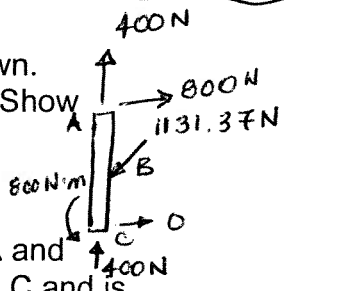


$CE = 12.5k\ (C)$

$CF = 26k\ (T)$

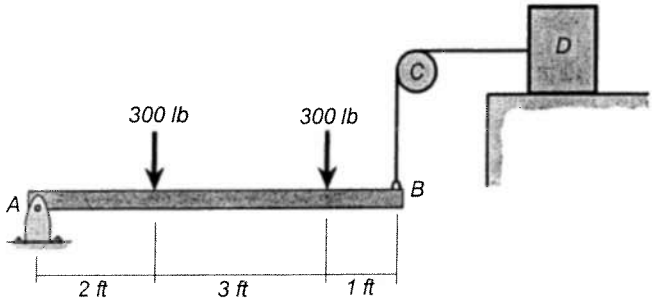
$AB = 6k\ (C)$

Problem 3 The structure (above right) has a fixed support at C, as shown. Determine all pin forces and support reactions acting on member *ABC*. Show your answers on a sketch of *ABC*. $C_x = 0$ $M_C = 800\ N \cdot m$ $C_Y = 400\ N$



Problem 4

Beam AB supports two 300 lb loads as shown. The beam is pinned at A and suspended from a rope at B. The rope passes over a fixed rough peg at C and is connected to block D. The coefficient of static friction for all surfaces is $\mu_s = 0.20$. Determine the minimum weight of block D required to maintain the equilibrium of beam AB.

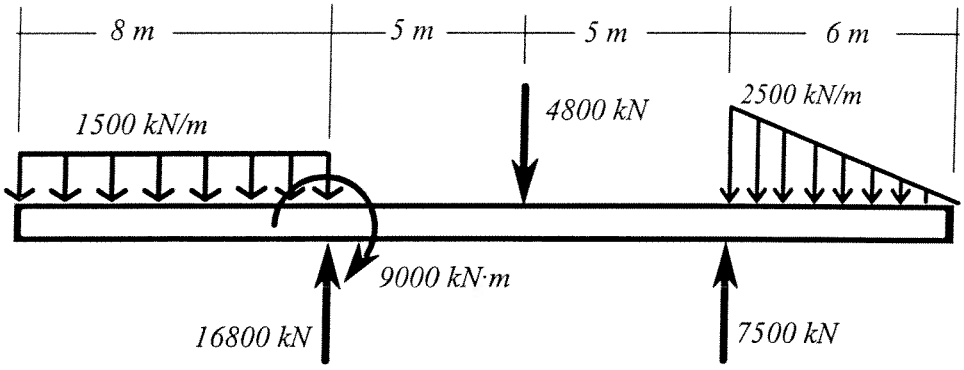


$W = 1278.2$ lb.

Check points ⇒ Moment @ 13 m = −15,000 kN·m
Max moment @ 8m = −48,000 kN·m
V @ 13 m = 4800 kN
V @ 18 m = 7500 kN

Problem 5

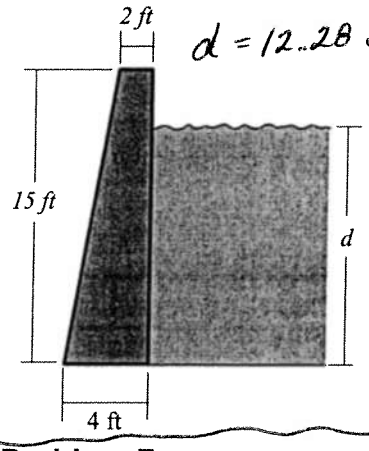
Draw the shear force and bending moment diagrams for the beam. Label all critical points.



Problem 6

A dam is constructed as shown (below left). The specific weight of water is *62.4 lb/ft*^{3} and the specific weight of the concrete is *175 lb/ft*^{3}. What is the maximum depth the water can reach before the dam tips over? Assume that the width of the dam (into the page) is *1 ft*.

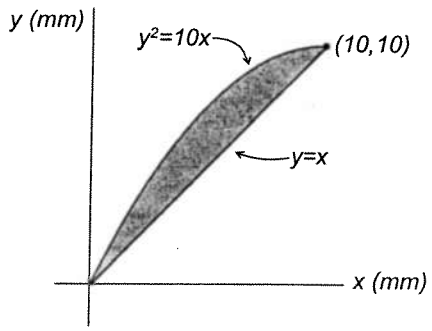
d = 12.28 ft.



Problem 7

Find the centroid $(\bar{x}, \bar{y})$ of the area (above right) bounded by the curves shown.

(4.00 mm, 5.0 mm)



Problem 8

(a) Find I_x, I_y and I_{xy} for the area shown
(b) Find the direction of the principal axes with origin located at point O, and find the principal moments of inertia about these axes. Draw the principal axes on the diagram and label max/min.

(a) $I_x = 46.33\ in^4$
$I_y = 12.33\ in^4$
$I_{xy} = 18.75\ in^4$

(b) $I_{max} = 54.64\ in^4$
$I_{min} = 4.02\ in^4$