題號： 230
科目： 應用力學(A)
節次： 7

國立臺灣大學 107 學年度碩士班招生考試試題

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Problem 1 (25%)

An exhaust system for a pickup truck is shown in the figure. The weights W_h, W_m, and W_t of the headpipe, muffler, and tailpipe are 10, 100, and 50 N, respectively, and act at the indicated points. If the exhaust-pipe hanger at point A is adjusted so that its tension F_A is 50 N and the force system at point O is zero,

a) Determine the required forces in the hangers at points B. **(10%)**
b) Determine the required forces in the hangers at points C. **(10%)**
c) Determine the required forces in the hangers at points D. **(5%)**

Dimensions in meters
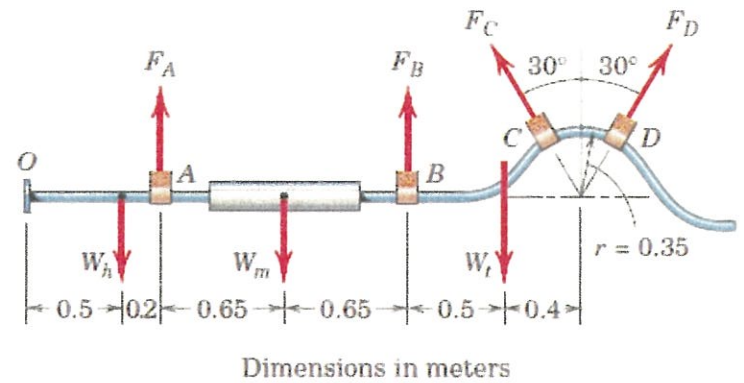
Problem 2 (25%)

Determine the force P required to force the 10° wedge under the 90-kg uniform crate which rests against the small stop at A. The coefficient of friction for all surfaces is 0.40. (Hint: $\tan^{-1} 0.4 = 21.8°$)
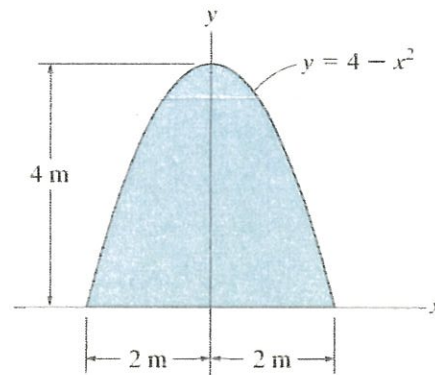
a) Draw the free-body diagram of the crate and wedge, respectively. **(10%)**
b) Determine P of which the unit is N. **(15%)**
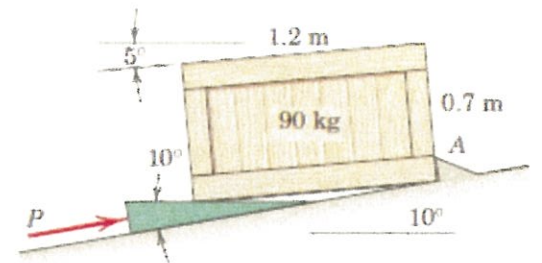
Problem 3 (20%)
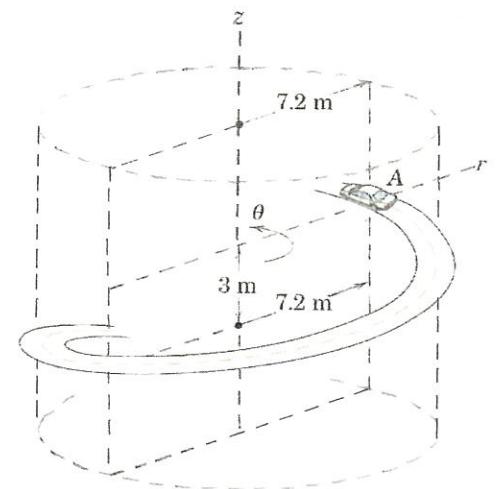
Consider the shaded area shown in the figure.

a) Determine the moment of inertia about the x axis. **(10%)**
b) Determine the moment of inertia about the y axis. **(10%)**

$y = 4 - x^2$

Problem 4 (30%)

The car A is ascending a parking-garage ramp in the form of a cylindrical helix of 7.2-m radius rising 3 m for each half turn. At the position shown the car has a speed of 25 km/h, which is decreasing at the rate of 3 km/h per second.

a) Determine the r- component of the acceleration of the car. **(10%)**
b) Determine the θ-component of the acceleration of the car. **(10%)**
c) Determine the z-component of the acceleration of the car. **(10%)**

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