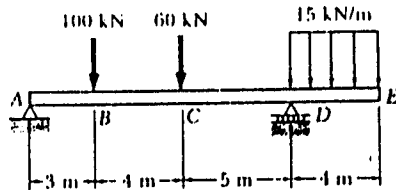
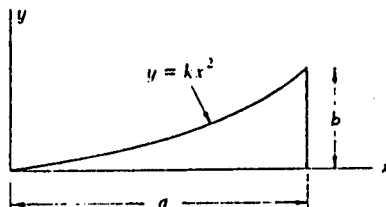


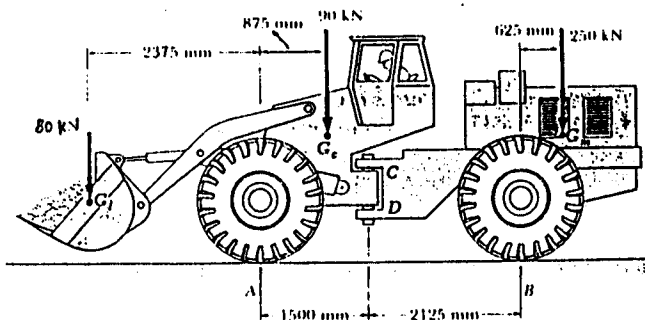
1. (10%) Draw the shear and bending-moment diagrams for the beam and loading as shown.



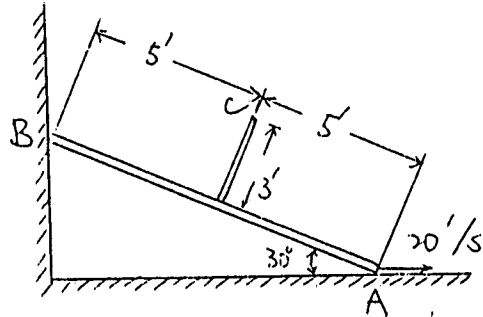
2. (15%) Determine the centroid  $(\bar{x}, \bar{y})$  of a parabolic spandrel as shown, by direct integration.  
 (Note: the value of  $k$  can be determined by substituting  $x = a$  and  $y = b$ , and we have  $k = b/a^2$ )



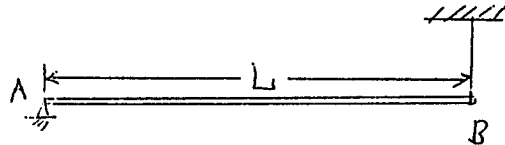
3. (15%) The cab and motor units of the front-end loader shown are connected by a vertical pin located 1500 mm behind the cab wheels. The distance from  $C$  to  $D$  is 750 mm. The center of gravity of the 250-kN motor unit is located at  $G_m$ , while the centers of gravity of the 90-kN cab and 80-kN load are located, respectively, at  $G_c$  and  $G_l$ . Knowing that the machine is at rest with its brakes released, determine (a) the reactions at each of the four wheels, (b) the forces exerted on the motor unit at  $C$  and  $D$ .



4. 一桿沿平行於紙之平面運動，其A端之速度為20呎/秒且減速率為10呎/秒，當BA與水平面成 $30^\circ$ 時，C點之速度及加速度各若干？(20%)



5. 一均勻桿重 $W$ ，於A點被栓住，於B點被金屬線拉住。試求線斷之瞬間及桿已轉動 $45^\circ$ 的時候作用於點A之力為若干？(20%)



6. 一常值力 $P$ 施於重 $W$ 之桿上。桿之兩端均支承於無摩擦牆面，設開始時桿係由 $\beta = 45^\circ$ 之位置由靜止狀態滑動，求A端移動距離 $d = 5$ 呎時角速率 $\dot{\beta}$ 。(20%)

