※ 考生請注意：本試題 ☑可 ☐不可 使用計算機

1. After deploying its drag parachute, the airplane in Fig. 1 has an acceleration $a = -0.004v^2$ m/s^2.
   (A) Determine the time required for the velocity v to decrease from 80 m/s to 10 m/s (10%)
   (B) What distance does the plane cover during that time? (10%)

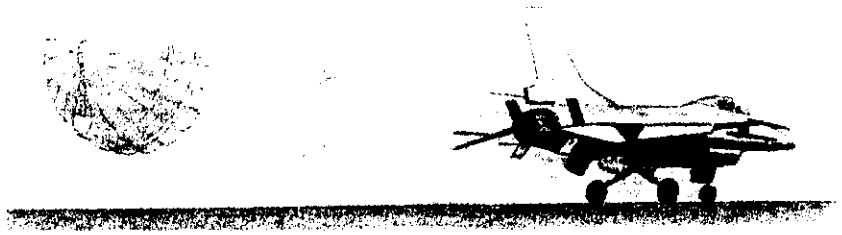
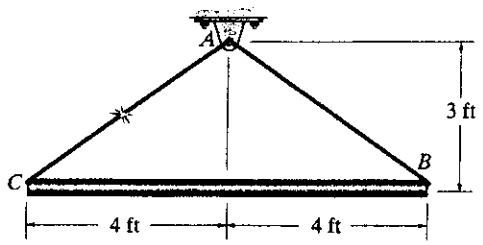
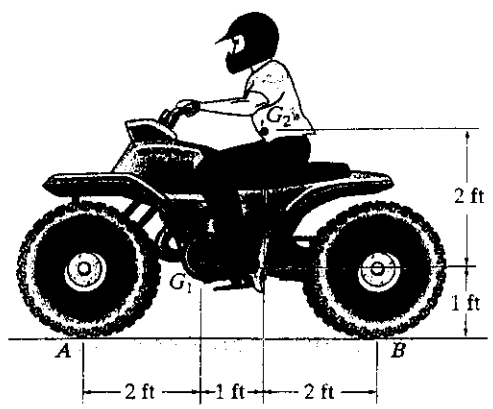


Fig. 1

2. The slender 150 lb bar is supported by two cords AB and AC. If cord AC suddenly breaks, (A) Determine the initial angular acceleration of the bar. (10%)
   (B) Determine the tension in cord AB. (10%)



3. The four-wheeler has a weight of 335 lb and center of gravity at G_1, whereas the rider has a weight of 150 lb and center of gravity at G_2. The front wheels are free to roll. Neglect the mass of the wheels in the calculation. If the coefficient of static friction between the rear wheels and the ground is μ_s=0.3
   (A) Determine the greatest acceleration the vehicle can have. (12%)
   (B) In order to increase the acceleration, should the rider crouch down or sit up straight from the position shown? Explain. (8%)



(背面仍有題目，請繼續作答)

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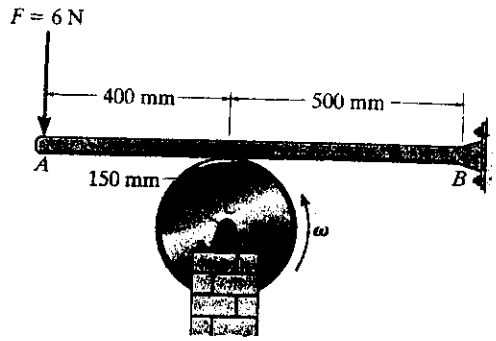
4. The 15 kg cylinder is rotating with an angular velocity of $\omega = 40$ rad/s. If a force F=6N is applied to link AB, as shown. Determine the time needed to stop the rotation. The coefficient of kinetic friction between AB and the cylinder is μ_k=0.4. (20%)



5. The slotted bar rotates in the horizontal plane with constant angular velocity ω_0. The mass m has a pin that fits in the slot of the bar. A spring with spring constant k holds the pin against the surface of the fixed cam. The surface of the cam is described by $r = r_0(2 - \cos\theta)$.

(A) Determine the radial and transverse components of the total external force exerted on the pin as functions of θ. (10%)

(B) Determine the smallest value of the spring constant k for which the pin will remain on the surface of the cam. (10%)