1. Block B of the mechanism is confined to move within the slot member CD, as shown in Fig. 1. When member AB is rotating at a constant angular velocity of $\omega_{AB} = 3$ rad/sec clockwise, determine
   (a) (15%) angular velocity of member CD, and
   (b) (15%) angular acceleration of CD.

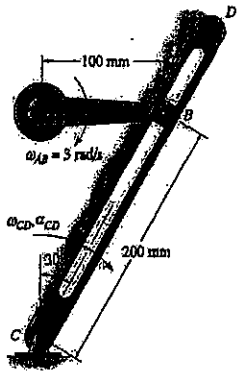


Figure 1

2. A particle having a mass m is subjected to a force of $F=a-bx$, where $a$ and $b$ are constants, and x is the displacement of the particle. Please do the following
   (a) (5%) determine the potential energy V(x),
   (b) (5%) make a plot of the potential energy versus x,
   (c) (5%) determine the stable equilibrium position of the particle.

3. Define the following terms and make an example for each term:
   (a) (5%) Angular impulse
   (b) (5%) Conservative force
   (c) (5%) D'Alemberts Principle
   (d) (5%) Inelastic collisions

4. A passenger car is modeled as shown in Fig. 2. The center of mass of the vehicle is at G and weighs 1200Kg. The wheel base (distance between the front and rear axle center) is b+c =2400 mm and b=1100 mm is the distance between the center of mass and the front axle center. When it is parked on a flat surface, the center of mass is h=450 mm above the ground. The wheel radius is r=300 mm, and on a good road surface, the coefficient of friction between the tires and road is $\mu$=0.8. Assume that the weights and moments of inertia of the wheel are neglected.
   (a) (10%) Calculate the ratio of the maximum acceleration that the vehicle can achieve to the gravitational acceleration, g, if the vehicle is driven by the front wheel (left one in the figure);
   (b) (10%) Same condition with (a) except that the car is driven by the rear wheel;
   (c) (15%) If the braking effort is optimally applied between front and rear wheels, what is the maximum deceleration that can be achieved?

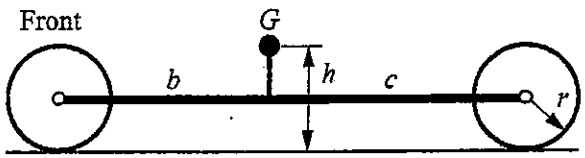


Figure 2