$$\ddot{x} + a\dot{x} = 0 \qquad \dot{y} + ay = 0$$

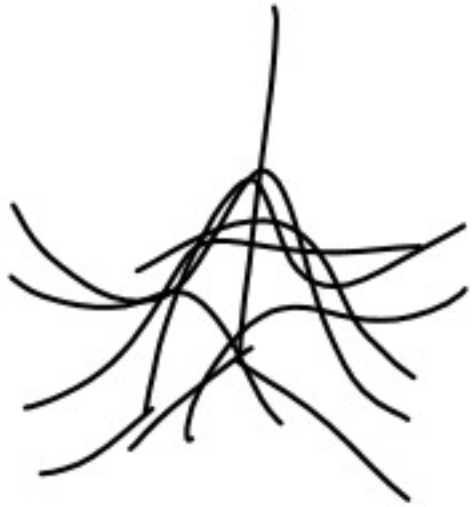
$$\dot{y} = \ddot{x} \qquad \dot{x} - y = 0$$

$$\begin{bmatrix} \dot{x} \\ \dot{y} \end{bmatrix} = \begin{bmatrix} 0 & 1 \\ 0 & -a \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix}$$

$$\dot{x} = Ax + Bu$$

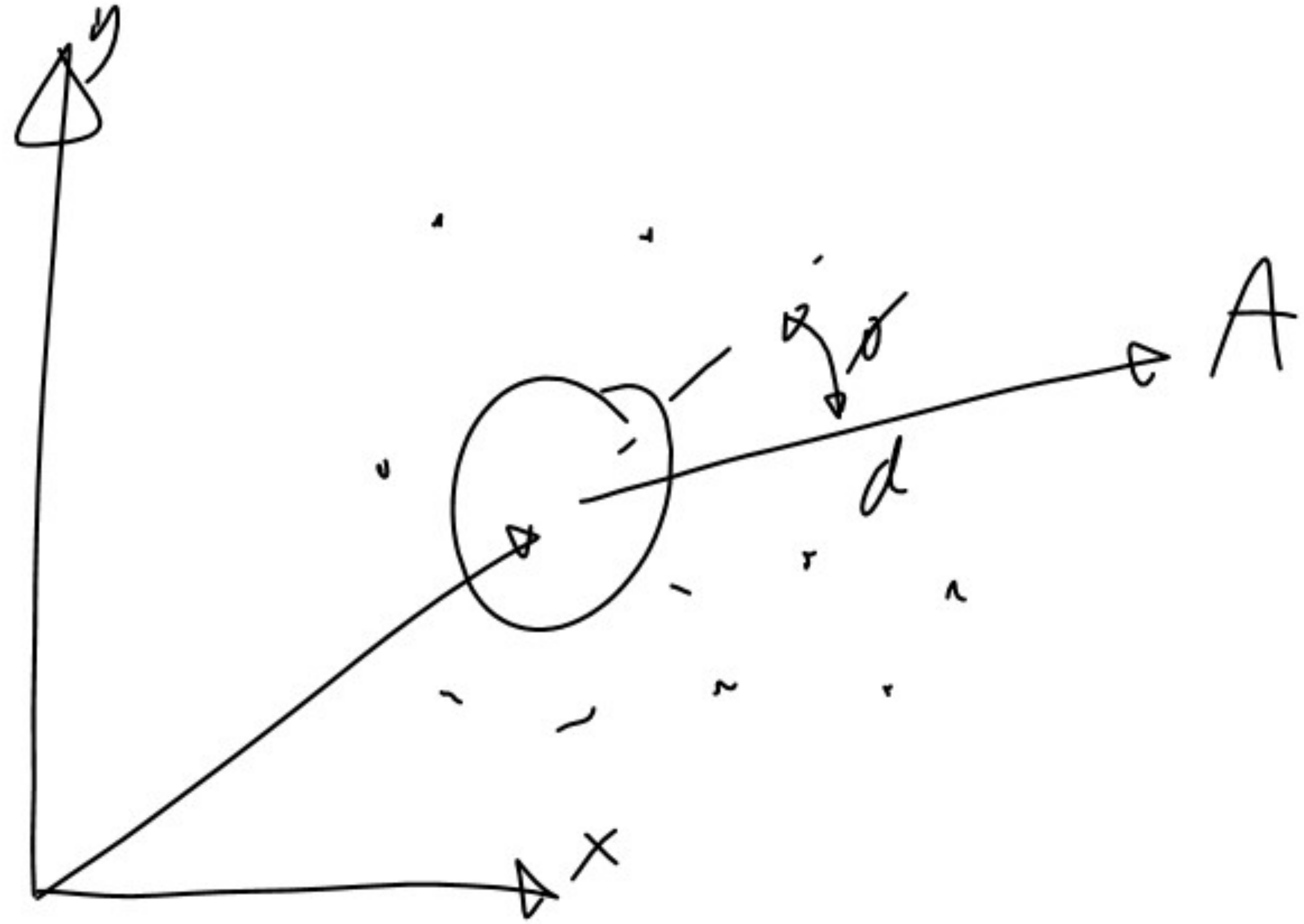
$$\ddot{x} + a\dot{x} + b = 0$$

$$\lambda^2 + a\lambda + b = 0$$

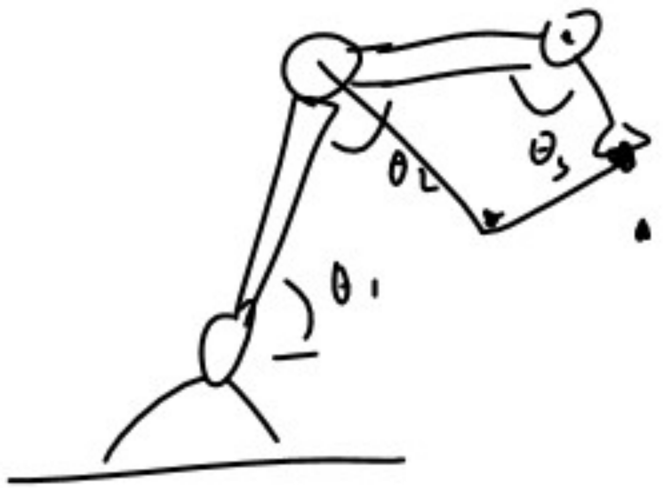


$$p(x) = \frac{1}{\pi\sqrt{\sigma}} e^{-\frac{(x-\mu)^2}{\sigma^2}}$$

$$p(X) = |2\Sigma|^{-1/2} \exp(-(X-\mu)^T \Sigma^{-1} (X-\mu))$$



$$\begin{bmatrix} x_1 & x_2 & \cdots & x_n \\ y_1 & y_2 & \cdots & y_n \\ \theta_1 & \theta_2 & & \theta_n \end{bmatrix} + \begin{bmatrix} 0 \\ 0.1 \\ 0 \end{bmatrix}$$



$$\begin{bmatrix} d\theta_1/d_x & d\theta_2/d_x \\ d\theta_1/d_y & d\theta_2/d_y \end{bmatrix} = J$$

$$\dot{X} = J\,\dot{\theta}$$

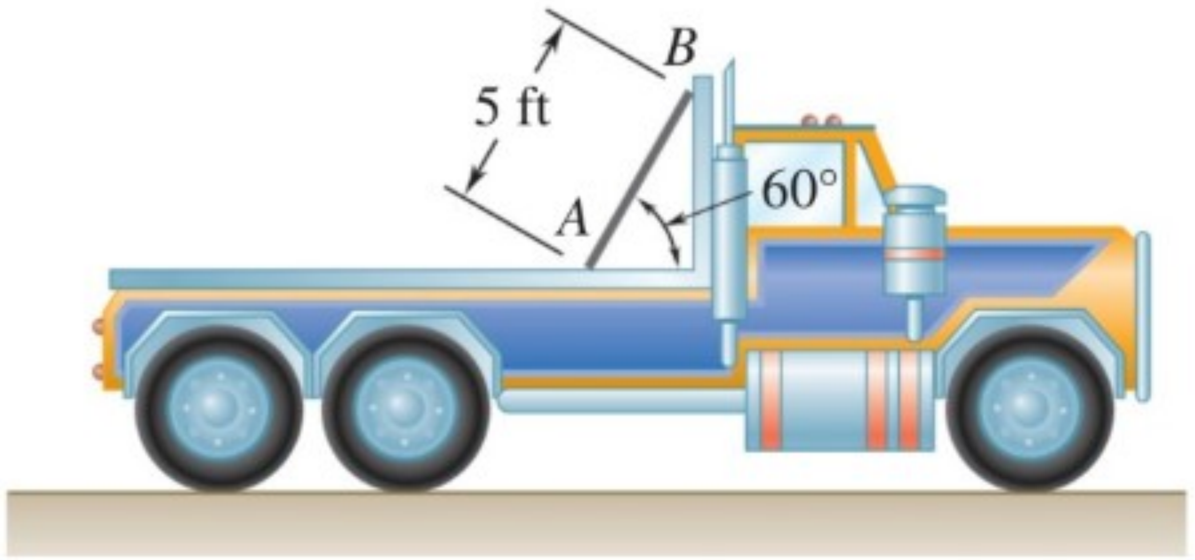
$$J^{-1}\dot{X} = \dot{\theta}$$

A 60-lb uniform thin panel is placed in a truck with end *A* resting on a rough horizontal surface and end *B* supported by a smooth vertical surface. Knowing that the panel remains in the position shown, determine (*a*) the maximum allowable acceleration of the truck, (*b*) the corresponding minimum required coefficient of static friction at end *A*.

$R_{Ay} = 60$ lb

$R_{Ax} = ma = 1.86 \cdot 18.6$

$= 34.6$ lb

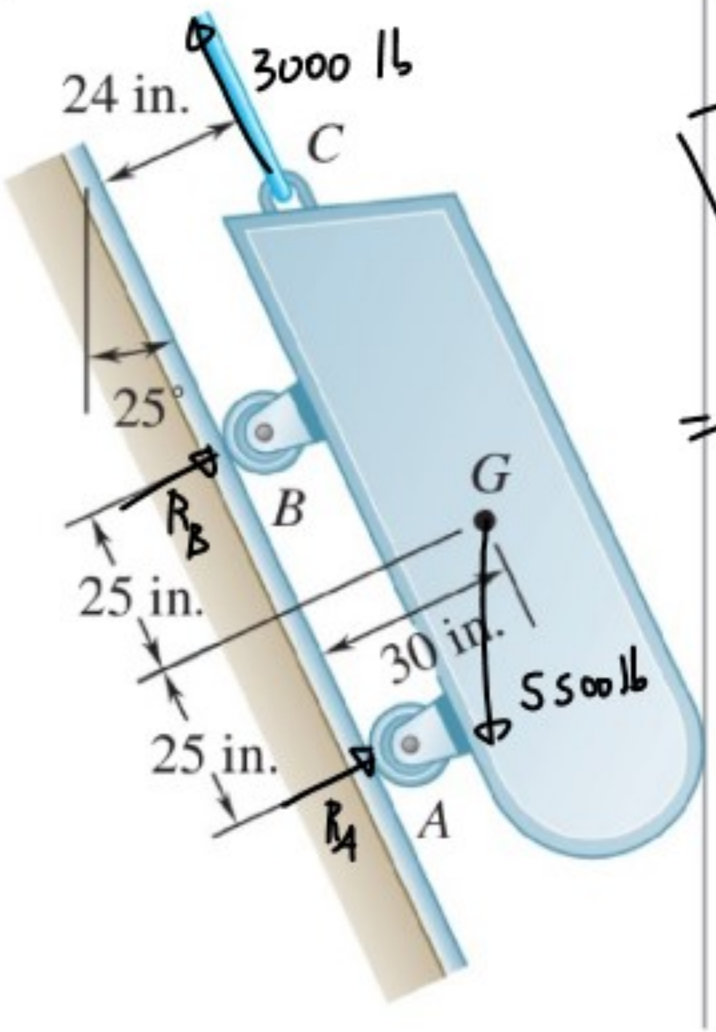


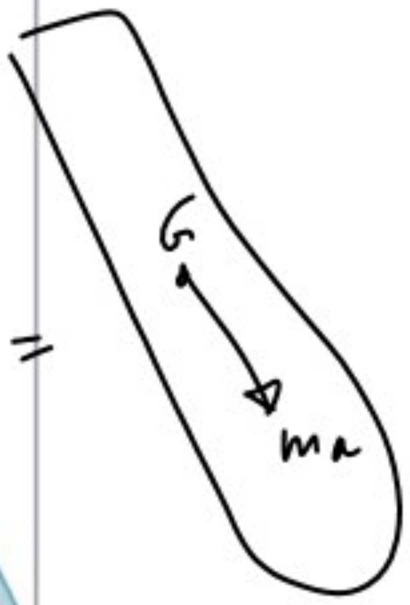
$F = \mu N$

$34.6 = \mu\, 60$

$\frac{34.6}{60} = \mu = 0.58$

A loading car is at rest on a track forming an angle of 25° with the vertical. The gross weight of the car and its load is 5500 lb, and it acts at point *G*. Knowing the tension in the cable connected at *C* is 3000 lb, determine (*a*) the acceleration of the car, (*b*) the reaction at each pair of wheels.





$W_{Gx} = 5500 \sin 25 = 2324 \text{ lb}$

$W_{Gy} = 5500 \cos 25 = 4985 \text{ lb}$

$m = \dfrac{5500 \text{ lb}}{32.2 \text{ ft/s}^2} = 171 \text{ slug}$

$\Sigma F_x = m a_x$ ($a_x \to 0$)

$R_B + R_A - W_{Gx} = 0$

$\Sigma F_y = m a_y$

$3000 - 4985 = m a_y = 171 a_y$

$\dfrac{-1985}{171} = \boxed{11.6 \text{ ft/s}^2}$

$\Sigma M_G = \dot{H}_G = 0$

$-6 \cdot 3000 - 25 \cdot R_B + 25 \cdot R_A = 0$