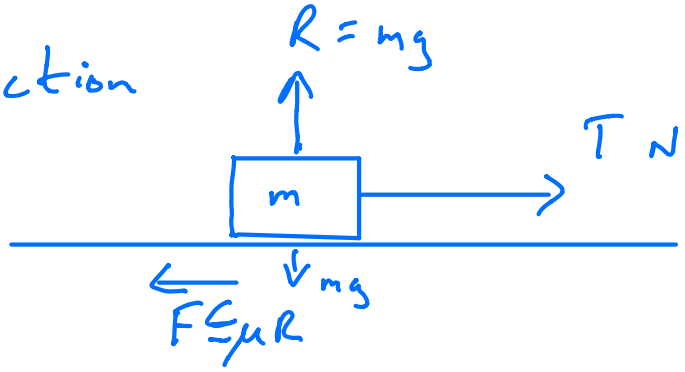
Work done = Force × distance

(where force is in direction of motion)

Work done against gravity = mgh

m = mass, g = acc due to gravity, h = height raised

Friction



μ coefficient of friction

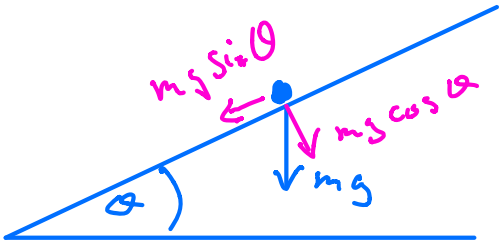
$\mu > 0$

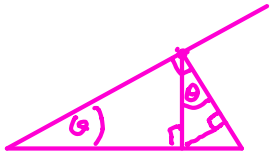
Suppose $\mu = \frac{1}{2}$

What must T be to get box moving

$$T - F > 0$$
$$T > F$$
$$T > \mu R$$
$$T > \tfrac{1}{2} mg$$

Inclined Plane

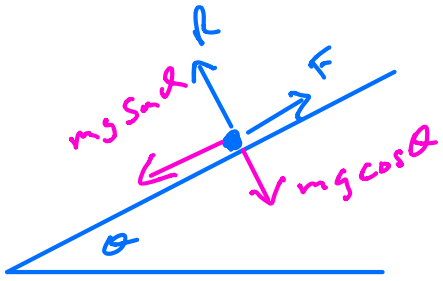




Weight components

Parallel to slope = $mg\sin\theta$

Perpendicular to slope = $mg\cos\theta$



$R = mg\cos\theta$

$F \leq \mu R$

If body is on of moving $F = \mu R$

and $F = mg\sin\theta$

$\Rightarrow \quad \mu R = mg\sin\theta$

$\mu mg\cos\theta = mg\sin\theta$

$\mu\cos\theta = \sin\theta$

$\mu = \frac{\sin\theta}{\cos\theta}$

$\mu = \tan\theta$