Formulas PHYS102, Common Exam 2, Spring 2022

Newton's 2nd law: $\vec{F}_{net} = m\vec{a}$

Static friction : $\left|\vec{f}_S\right| < \left|\vec{f}_S^{Max}\right| = \mu_S \left|\vec{F}_N\right|$

Kinetic friction : $\left|\vec{f}_k\right| = \mu_k \left|\vec{F}_N\right|$

$\vec{F}_N$ = (normal force)

Vector Components vs. magnitude and direction

$$\begin{cases} A_x = A\cos(\theta) \ (adjacent) = (hypotenuse)\times\cos\theta \\ A_y = A\sin(\theta) \ (opposite) = (hypotenuse)\times\sin\theta \end{cases}$$

$$\begin{cases} \left|\vec{A}\right| = \sqrt{\left(A_x\right)^2 + \left(A_y\right)^2} \\ \theta = \tan^{-1}\left(\dfrac{A_y}{A_x}\right) = \arctan\left(\dfrac{A_y}{A_x}\right) \\ \text{(add/subtract 180 deg if necessary)} \end{cases}$$

g = 9.8 m/s^2

Work-Energy Theorem: $W_{net} = K_f - K_i$

$$K = \frac{1}{2}mv^2$$

In 1D, $W_F = F\Delta x$

In 2D, $W_F = \left|\vec{F}\right|\left|\vec{d}\right|\cos\theta_{F,d}$

$$\equiv \vec{F}\cdot\vec{d} = F_x d_x + F_y d_y$$

Uniform circular motion

$$\left|\vec{a}\right| = \frac{v^2}{r}$$