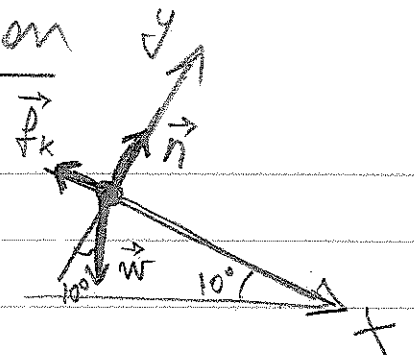
Skier with Friction



- Forces acting on skier: weight $\vec{w}$, normal force $\vec{n}$, friction force $\vec{f}_k$

- Newton's 2nd law:

$$\Sigma F_x = w \sin 10^\circ - f_k = m a_x$$

$$\Sigma F_y = n - w \cos 10^\circ = 0$$

(skier is in equilibrium along y axis) (no accel.)

$$\Rightarrow n = w \cos 10^\circ$$

$$\Sigma F_x = w \sin 10^\circ - \mu_k n = m a_x$$

$$= mg \sin 10^\circ - \mu_k mg \cos 10^\circ = m a_x$$

Dividing by m yields

$$g \sin 10^\circ - \mu_k g \cos 10^\circ = a_x$$

$$\Rightarrow a_x = (9.8\ m/s^2) \sin 10^\circ - 0.06\ (9.8\ m/s^2) \cos 10^\circ$$

$$= 1.13\ m/s^2$$

- Velocity at bottom of the slope

$$(v_x)_f^2 = (v_x)_i^2 + 2 a_x \Delta x$$

$$= 0 + 2\ (1.13\ m/s^2)\ (288\ m)$$

$$= 650.9\ m^2/s^2$$

$$\Rightarrow (v_x)_f = 25.5\ m/s$$

see lecture notes for frictionless case