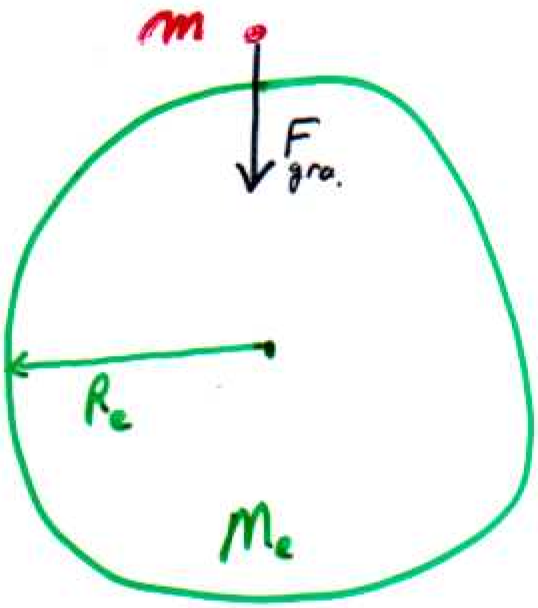
Object of mass m at surface of Earth





$$F_{gra} = \frac{G M_e m}{R_e^2}$$ N. U. L. G.

$$F_{2nd} = m a$$ N. 2nd Law

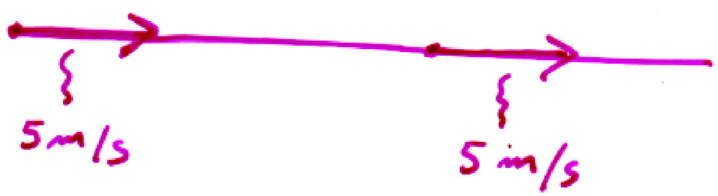
$$F_{gra} = F_{2nd}$$

$$\frac{G M_e \not{m}}{R_e^2} = \not{m} a$$

mass of object cancels ! !

$$a = g = \frac{G M}{R_e^2}$$

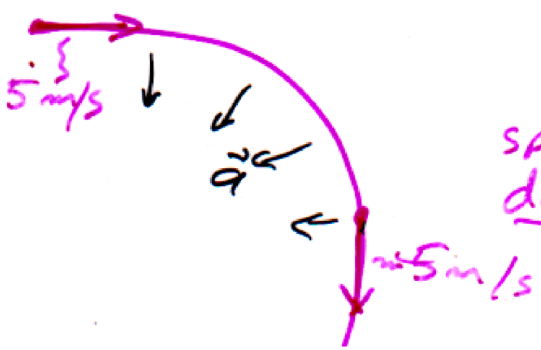
all objects accelerate near earth's surface with $g = 9.8\ m/s^2$ ($32\ ft/s^2$)




path {straight line


$\vec{a}$

straight line
speed changes




speed same
direction changed

Remember for later

acceleration (a)

$$a = \frac{v_{final} - v_{initial}}{t}$$

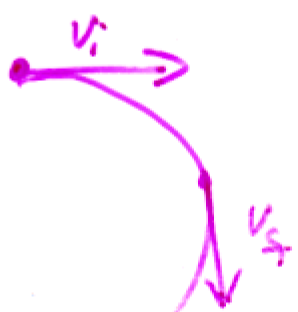
t ← time

Need measure of deviation from constant velocity (uniform motion)

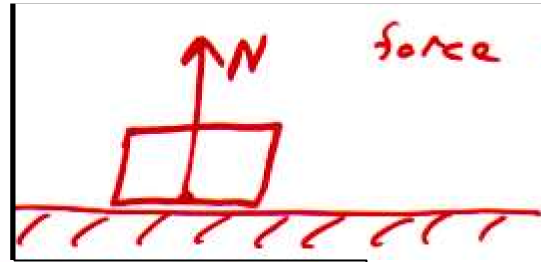
car

- slam on brakes
- depress accelerator pedal

acceleration also when only direction of $\vec{v}$ changes



# Normal Force

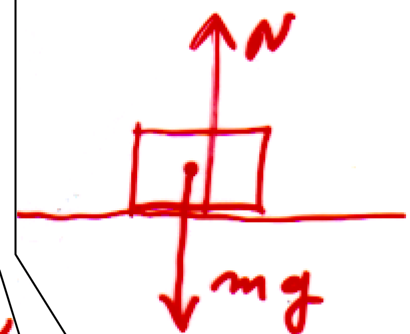



force of surface on object

⊥ to surface

$$\sum_i F_{y_i} = N - mg = m a_y = 0$$

does not "hop"
does not "burrow"
(or sink)




↑ y dir

balanced forces on object in y direction

$$\vec{F}_{total} = m\vec{a}$$

$$F_x = m a_x \qquad F_y = m a_y$$

(tot) (tot)

will look at $\sum F_y = 0 = N - mg$

but $\sum_x F_x \neq 0 \Rightarrow \exists\, a_x$