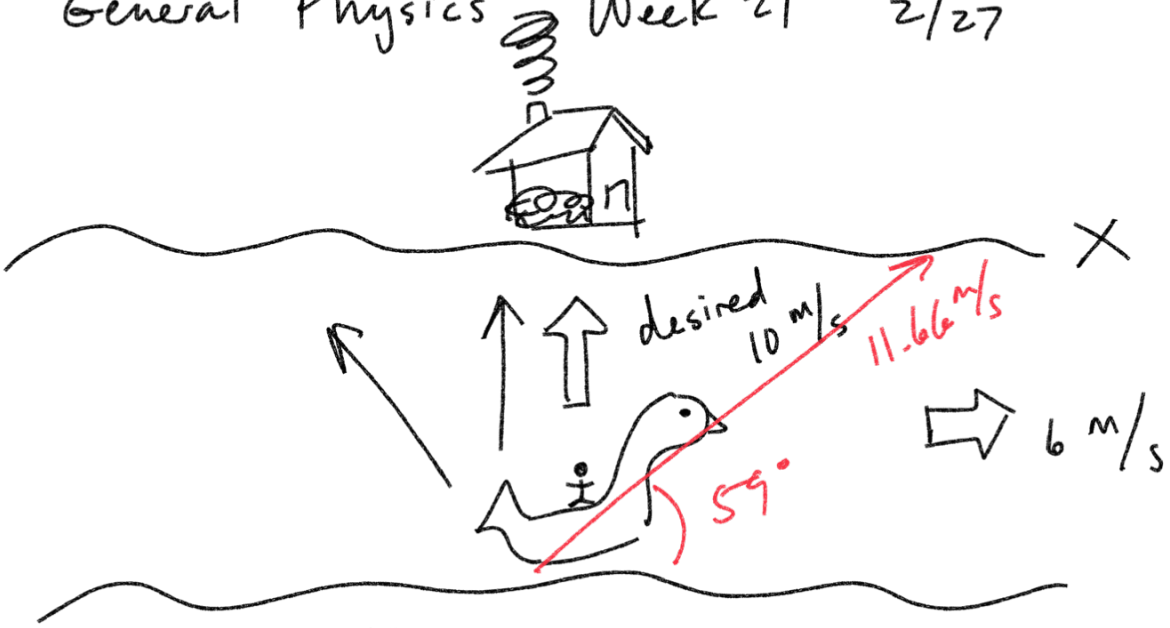
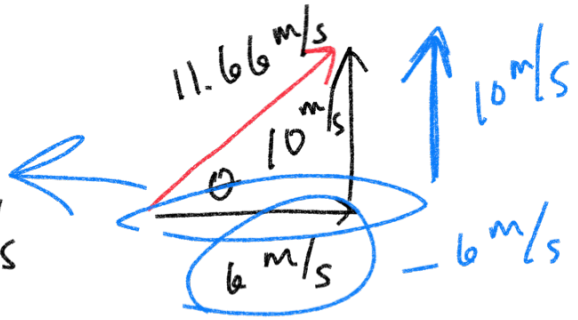
M-GP General Physics Week 21 2/27



$\sqrt{(6)^2 + (10)^2}$

$\sqrt{36 + 100}$

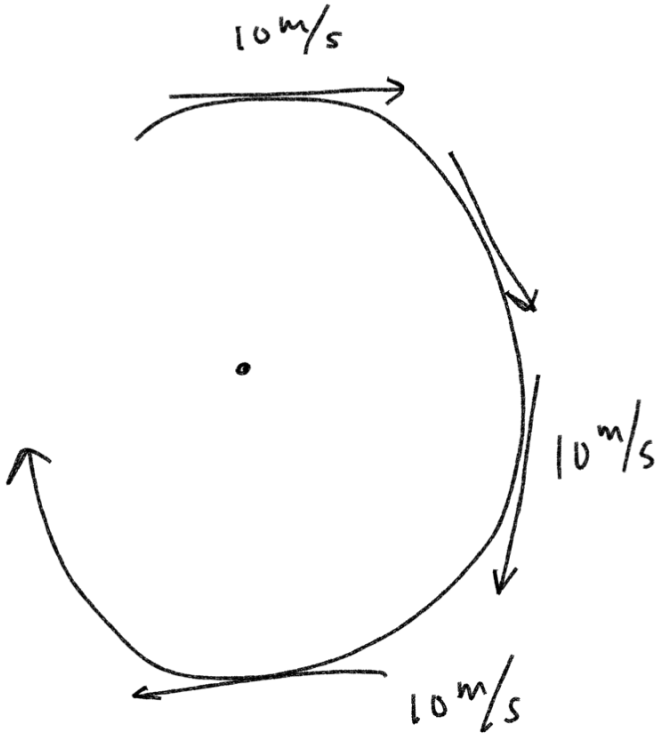
$\sqrt{136} = 11.66\ m/s$



$\theta = \tan^{-1}\frac{y}{x}$ · $\theta = \tan^{-1}\frac{10}{6} = 59°$

$\theta = \tan^{-1}\frac{10}{-6} = -59°$ or $121°$

Uniform Circular Motion



If traveling in a circle — direction is always changing.

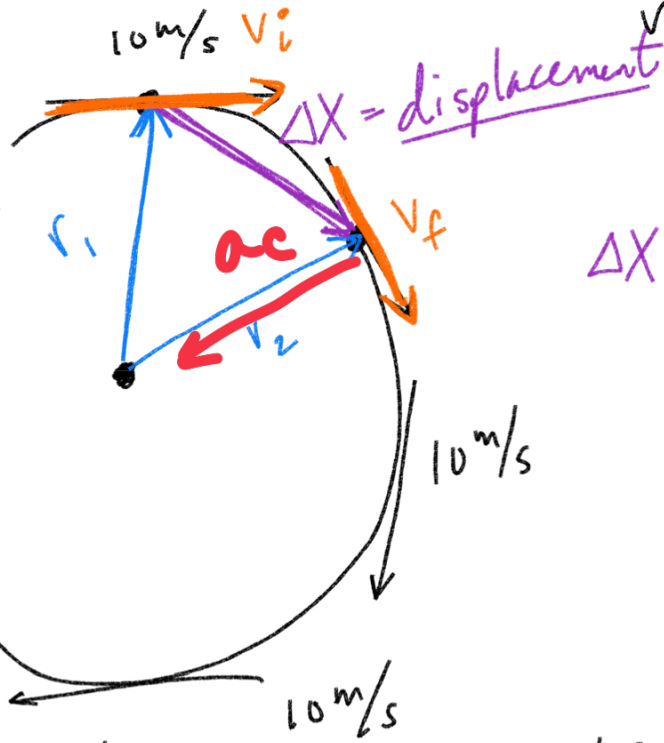
since velocity is a vector — with a magnitude and direction —

velocity is changing

↓

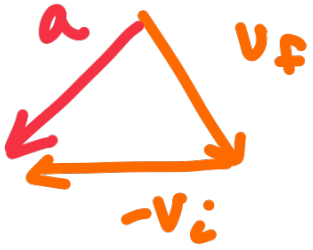
acceleration

velocity moves tangentally

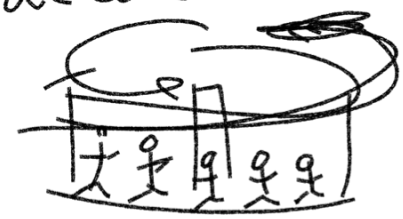


$$\Delta X = X_f - X_i$$

$$a = V_f - V_i$$



centrifugal acceleration



force away from the center.

a_c centripetal acceleration is acceleration towards the center of the circle and perpendicular to velocity.

Simulate gravity

$$\left\{ a_c = \frac{v^2}{r} \right\} \Rightarrow \frac{(m/s)^2}{m} = \frac{m^2/s^2}{m^1}$$

$$a = m/s^2$$

Radius of station:

$$r = 5000\ m$$

gravity $= 9.8\ m/s^2$

$$(a_c)r = \left(\frac{v^2}{r}\right)r$$

$$\sqrt{(a_c)(r)} = \sqrt{v^2}$$

$$v = \sqrt{(a_c)(r)} = \sqrt{(9.8\ m/s^2)(5000\ m)}$$

$$= 221\ m/s$$

Jordy placed medal on a 3 m string. If she spun it at a constant 12 m/s in a circular motion, what is the centripetal acceleration?

$$a_c = \frac{v^2}{r} = \frac{(12\ m/s)^2}{3\ m} = \frac{144\ m^2/s^2}{3\ m}$$

$$48\ m/s^2$$

satellite:

$v = 17{,}000 \text{ mi/hr}$

$r = 4000 \text{ mi}$

$$a_c = \frac{v^2}{r}$$

a_c

$$= \frac{(17{,}000 \text{ mi/hr})^2}{4{,}000 \text{ mi}}$$

$$72{,}250 \text{ mi/hr}^2$$