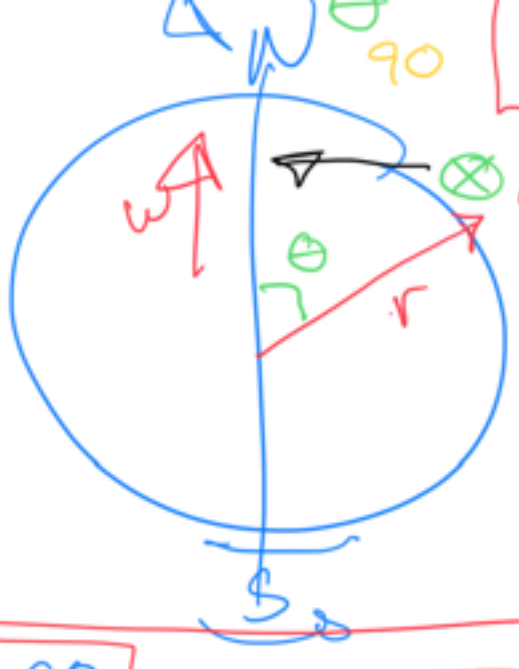
$\omega \times \omega = 0$

90

$\omega \times (\omega \times r)$



$p = mv$

$L = I\omega$

90 0

$\tau = r \times F$

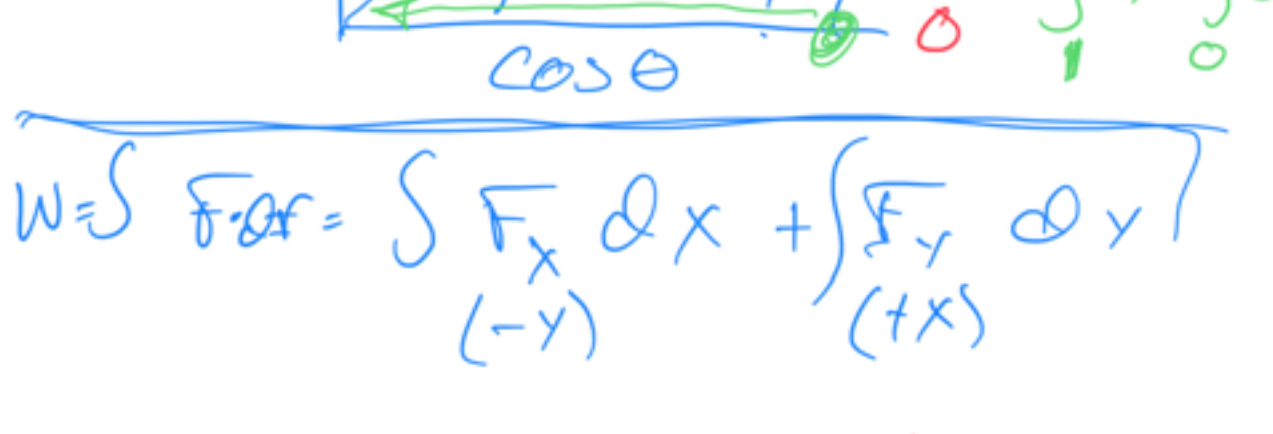
$L = r \times p$

mv

$dA = \frac{1}{2} r^2 d\theta$

$A = \frac{1}{2} r \cdot r\theta$

$dA \sim L$



$F = \frac{GMm}{r^2}$

$\tau = r \times F = 0$

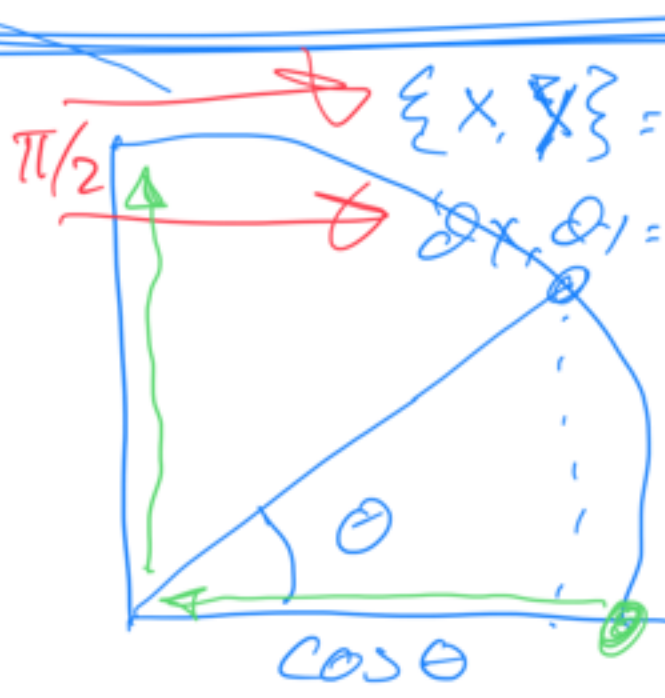
$F = ma = \frac{dp}{dt}$

$F = \frac{GMm}{r^2} = \frac{mv^2}{r}$

$\tau = I\alpha = \frac{dL}{dt}$

$L = \text{const}$

$v = \frac{x}{t} = \frac{2\pi r}{T}$



$\{x, y\} = \{\cos\theta, \sin\theta\}$

$\{dx, dy\} = \{-\sin\theta, \cos\theta\} d\theta$

$\int_1^0 dx \int_0^1 dy$

$W = \int F \cdot dr = \int F_x dx + \int F_y dy$

$(-y) \quad (+x)$

$(-\sin\theta)(-\sin\theta\, d\theta)$

$F = (-y, +x) = (-y)\hat{x} + (+x)\hat{y}$

$F_x \quad F_y$

$F = ma \quad \tau = I\alpha$

① $N - m_1 g \cos\theta = 0$

② $m_1 a = m_1 g \sin\theta - T$

$\tau = I\alpha$

③ $Tr = \frac{1}{2} m_2 r^2 \alpha$

NaTα

④ $a = r\alpha$

$\alpha = \frac{a}{r}$

③ $T = \frac{1}{2} m_2 a$

$A = \frac{1}{2} r^2 \theta$

② $\frac{dA}{dt} = \frac{1}{2} r^2 \frac{d\theta}{dt}$

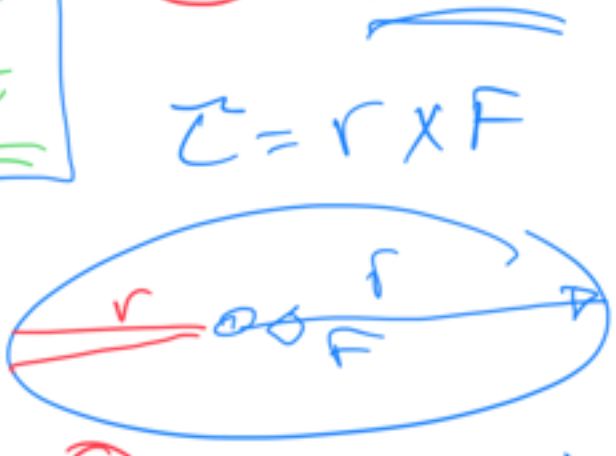
$L = r \times p_{mv}$

③ $= r\, mv$

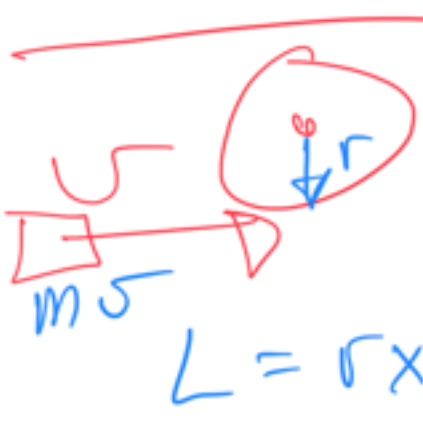
$\tau = r \times F$

$F = ma = \frac{dp}{dt}$

$\tau = I\alpha = \frac{dL}{dt} \Rightarrow$ ① $L = \text{const}$



$\frac{dA}{dt} \sim L = \text{const}$



$L = r \times p$

$p = mv$

$L = I\omega$

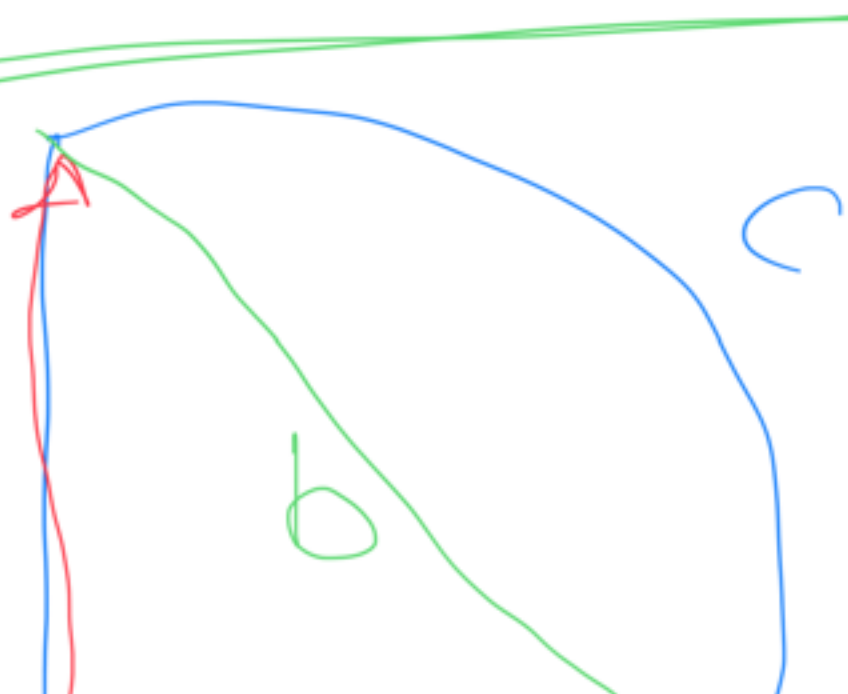
$L_{Before} = L_{After}$

$m_1 v_1 r = I_1 \omega + I_2 \omega$

$\frac{1}{2} m_2 r^2 \omega$

$I_1 \omega$

$m_1 v_1 r = (m_1 r^2)\omega + (\frac{1}{2} m_2 r^2)\omega$



$x + y = 1$

$y = 1 - x$

$dy = -dx$

$x = \cos\theta \quad y = \sin\theta$

$dx = \quad dy =$