MONDAY, JAN 9 2012

HOMEWORK DUE ONCE A WEEK

- CLEAR / ORGANIZED
- GIVENS / KNOWNS LIST
- FREE-BODY DIAGRAMS

"CONSISTENTLY DO WELL ON HOMEWORK AND YOU SHOULDN'T HAVE TO WORRY ABOUT YOUR GRADE"

NOTES:

DYNAMICS → PARTICLE, RIGID BODY

PARTICLE → KINEMATICS, KINETICS

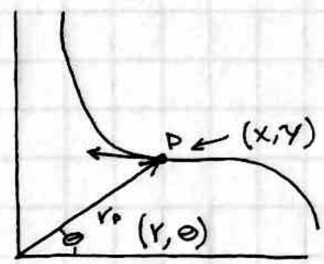
RIGID BODY → SAME 2 CATEGORIES

KINEMATICS
- POSITION
- VELOCITY
- ACCELERATION

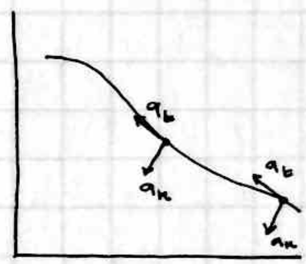
KINETICS

$\underbrace{\sum \vec{F} = m\vec{a} \qquad \sum M_o = I\alpha \} \ \frac{d^2\theta}{dt^2}}_{\text{INCLUDE'S MASS}}$

COORDINATE SYSTEMS:

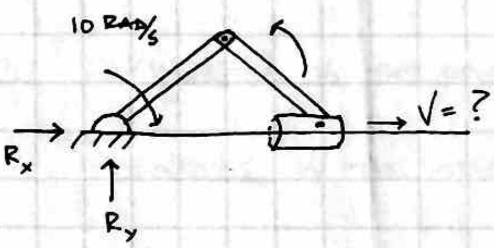



"CYLINDRICAL"




CURVILINEAR

RIGID BODY DYNAMICS




KINETICS:

1.) F = ma
2.) KE, PE
3.) IMPULSE / MOMENTUM

HOMEWORK WILL BE POSTED 1/9/2012

# DYNAMICS NOTES (READING)

## RECTILINEAR KINEMATICS:

STRAIGHT LINE PATH — $s$ = POSITION VARIABLE

$$v = \frac{ds}{dt} \quad a = \frac{dv}{dt} \text{ OR } a = \frac{d^2s}{dt^2}$$

THE 3 KINEMATICS EQUATIONS:

* CONSTANT ACCELERATION IS ASSUMED *

VELOCITY AS A FUNCTION OF TIME:

$$v = v_0 + a_c t$$

POSITION AS A FUNCTION OF TIME:

$$s = s_0 + v_0 t + \frac{1}{2} a_c t^2$$

VELOCITY AS A FUNCTION OF POSITION:

$$v^2 = v_0^2 + 2a_c(s - s_0)$$

<u>KINEMATICS</u> IS THE STUDY OF THE GEOMETRY OF MOTION

<u>KINETICS</u> IS THE STUDY OF THE FORCES THAT CAUSE THE MOTION

"A PARTICLE <u>CAN HAVE</u> AN ACCELERATION AND A ZERO VELOCITY"
- ONLY BRIEFLY HOWEVER

BY RELATING $v = \frac{ds}{dt}$ AND $a = \frac{d^2s}{dt}$ THROUGH A SEPARATION OF VARIABLES,

WE GET:

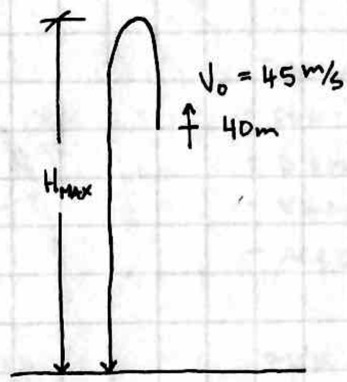
$a\,ds = v\,dv$ WHICH POST-INTEGRATION GIVES

$$\frac{v^2}{2} = \int a\,ds$$

JANUARY 11, 2012

RECTILINEAR POSITION, VELOCITY, ACCELERATION. CONSTANT AND VARYING ACCELERATIONS

HW FORMAT:




SMALL PROJECTILE FIRED:

$V_0 = 60 \, m/s$
$a = (-0.4v^3) \, m/s^2$

$$a = \frac{dV}{dt} \Rightarrow -0.4v^3 = \frac{dV}{dt} \Rightarrow \int_0^4 dt = \frac{1}{-0.4}\int_{60}^{V_F} V^{-3} \, dV$$

JANUARY 17, 2012 RECTILINEAR MOTION (READING NOTES)

WHEN A PARTICLE HAS ERADIC OR CHANGING MOTION, THEN ITS POSITION, VELOCITY, AND ACCELERATION CANNOT BE DESCRIBED BY A SINGLE CONTINUOS MATHEMATICAL FUNCTION. THE MOTION MUST BE DESCRIBED BY MULTIPLE FUNCTIONS, WHICH CAN BE EASIER DELT W/ USING GRAPHS.

FORMULA'S:

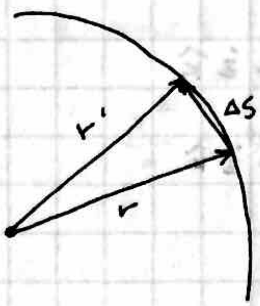
$V = \frac{ds}{dt}$ ; VELOCITY = SLOPE OF S-t GRAPH

JANUARY 23, 2012

HW. 3 ASSIGNEND, DUE FRIDAY

OFFICE HOURS CHANGED

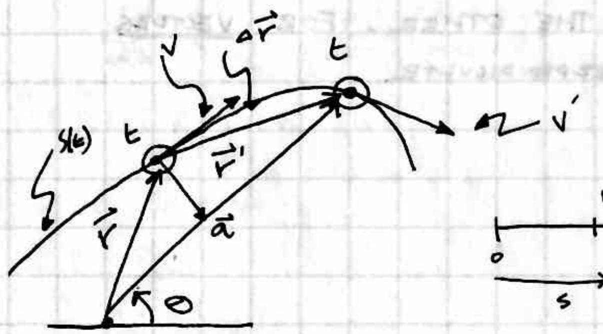
LECTURE 5 — CURVILINEAR MOTION

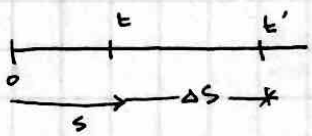



THINGS WE NEED TO BE ABLE TO FIND:

- POSITION $\vec{r}$
- DISPLACEMENT $\Delta\vec{r}$
- VELOCITY $\frac{\Delta r}{\Delta t} = \frac{dr}{dt}$
- ACCELERATION

PICK ORIGIN, ARBITRARILY

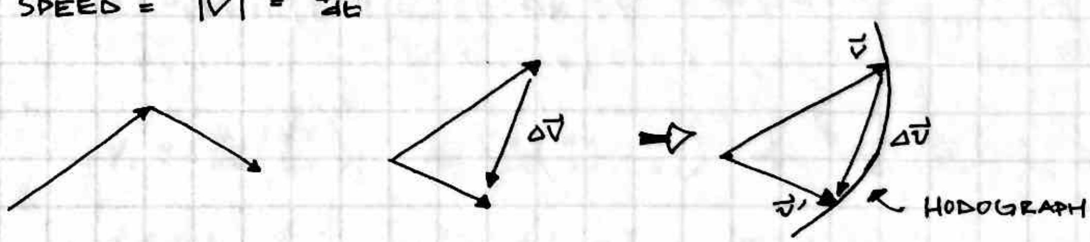



$$\boxed{\Delta\vec{r} = \vec{r}' + \vec{r}}$$

$$\frac{\text{CHANGE IN DISPLACEMENT}}{\text{CHANGE IN TIME}} = \vec{V}_{AVE} \Rightarrow \vec{V} = \frac{d\vec{r}}{dt}$$

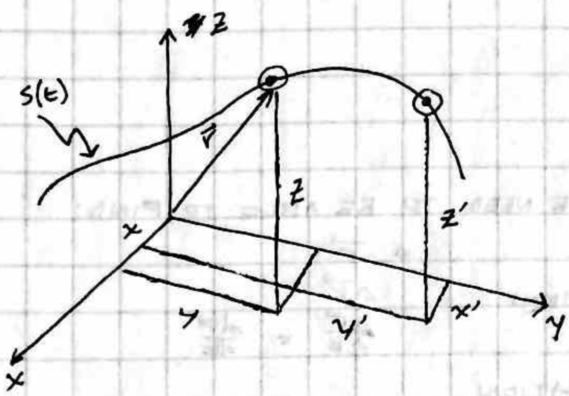
$$\text{SPEED} = |\vec{v}| = \frac{ds}{dt}$$




$\vec{v}$ TANGENT TO $s(t)$

$\vec{a}$ TANGENT TO HODOGRAPH

JANUARY 23, 2012, CONT.




$$\vec{r} = x\hat{i} + y\hat{j} + z\hat{k}$$

$$\vec{v} = \dot{x}\hat{i} + \dot{y}\hat{j} + \dot{z}\hat{k}$$

$$\vec{a} = \ddot{x}\hat{i} + \ddot{y}\hat{j} + \ddot{z}\hat{k}$$

ORTHAGONAL: TWO DIFFERENT VARIABLES — ONE CHANGES DOES NOT AUTOMATICALLY CHANGE THE OTHER. FOR VECTORS THAT MEANS THEIR PERPENDICULAR.

JANUARY 25, 2012

STEPHEN SILLS (HW GRADER)
SILLS @ ONID

ALWAYS STATE KNOWNS / UNKNOWNS

EXAMPLE :

$$\frac{x^2}{4} + y^2 = 1 \qquad \bar{V} = \dot{x}\,\hat{i} + y\,\hat{j}$$

$$|V| = \sqrt{(\dot{x})^2 + (\dot{y})^2}$$

$$\cancel{\frac{dy}{dx}} \qquad \frac{dy}{dt} = \left(\frac{dy}{dx}\right)\frac{dx}{dt} \qquad x^2 + 4y^2 = 4$$

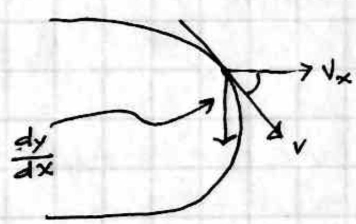
$$2x\,\frac{dx}{dt} + 8y\,\frac{dy}{dt} = 0$$

$$\frac{dy}{dx} = \frac{-x}{4y}$$

$$\frac{dx}{dt} = 10$$

$$\frac{dy}{dt} = \frac{dy}{dx}\,\frac{dx}{dt} = (-0.289)(10) = -2.89 \text{ m/s}$$

$$V_x = \frac{dx}{dt} \;;\quad V_y = \frac{dy}{dt}$$




$$a = \ddot{x}\,\hat{i} + \ddot{y}\,\hat{j} \qquad a_x = 0 \;\Rightarrow\; a = a_y$$

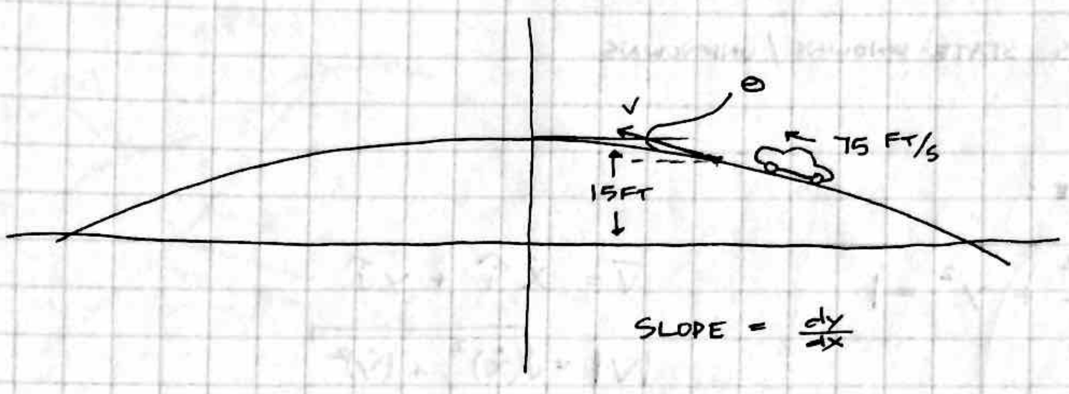
$$\ddot{y} = \frac{d}{dt}\left(\frac{dy}{dt}\right) \Rightarrow \frac{d}{dt}\left(\frac{dy}{dx}\cdot\frac{dx}{dt}\right) \Rightarrow \frac{d}{dt}\left(\frac{dy}{dx}\right)\cdot\frac{dx}{dt} + \cancelto{0}{\frac{d}{dt}\left(\frac{dx}{dt}\right)\frac{dy}{dt}}$$

$$\frac{d}{dt}\left(\frac{dy}{dx}\right)\cdot\frac{dx}{dt} = 10\,\frac{d}{dt}\left(\frac{-x}{4y}\right) = \left(\frac{10}{4}\right)\frac{d}{dt}\left(x\cdot y^{-1}\right)$$

$$= 2.5\left[\frac{dx}{dt}\left(y^{-1}\right) \ldots\right.$$

EXAMPLE

12.79




(CAN) SOLVE FOR θ

$a = [a_x, a_y]$

$a = \left[\frac{d^2x}{dt}, \frac{d^2y}{dt}\right]$

JANUARY 27, 2012

MOTION OF A PROJECTILE

LOOK FOR HW

* TEST ON MONDAY /6

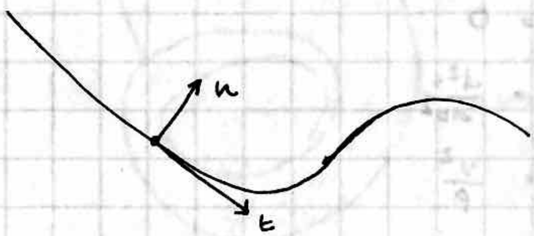
CONSTANT ACCELERATION DOWNWARD

WORK EXAMPLE 12.12, 12.90

JANUARY 30, 2012

COORDINATE SYSTEMS: $n$-$t$, $r$-$\theta$

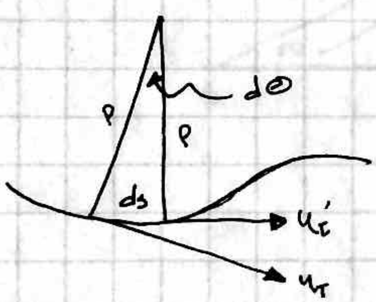
$n$-$t$, MOVES W/ PARTICLE (NORMAL - TANGENT) - TANGENT TO CURVE



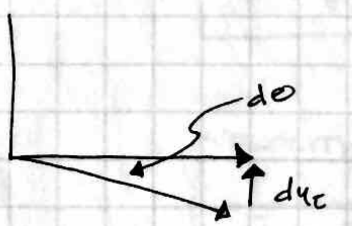

DISPLACEMENT: $ds$

IN $n$-$t$, VELOCITY HAS NO NORMAL COMPONENT

$$\vec{a} = \frac{d}{dt}(\vec{v}) = \frac{d}{dt}(v \cdot \vec{u}_t) = \frac{dv}{dt}u_t + \frac{du_T}{dt}v$$




$\Rightarrow$




$s = \rho\theta$

$ds = \rho d\theta$

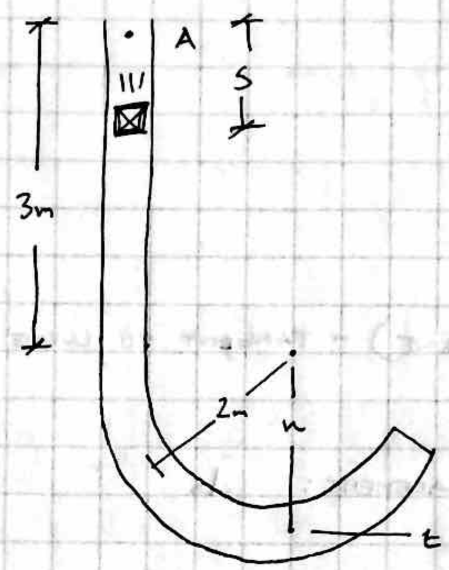
$\frac{ds}{dt} = \rho \cdot \frac{d\theta}{dt}$

$$\boxed{\frac{d\theta}{dt} = \frac{v}{\rho}}$$

$d(\vec{u}_t) = d\theta \cdot u_N$

ACCELERATION:

$$\vec{a} = a_t \cdot \vec{u}_T + a_n \cdot \vec{u}_n \qquad a_t \cdot ds = v \cdot dv \qquad a_n = \frac{v^2}{\rho}$$




$a_t = 0.2t \ m/s^2$

$V_n$ MUST BE ZERO

$$V_t = \frac{ds}{dt}$$

$$V_n = 0$$

$$a_t = \frac{d^2s}{dt^2}$$

$$a_n = \frac{v^2}{\rho}$$

PHYSICS CHALLENGE

DYNAMICS # 4

DYNAMICS # 5

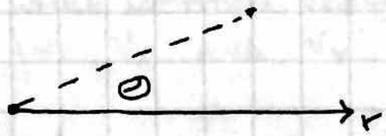
ENGR 202

MASTERING PHYSICS

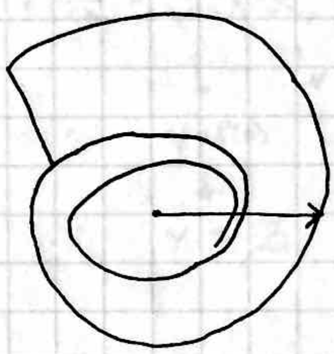
MATH

~~JANUARY~~ FEBRUARY 1, 2012

POLAR / CYLINDRICAL COORDINATES



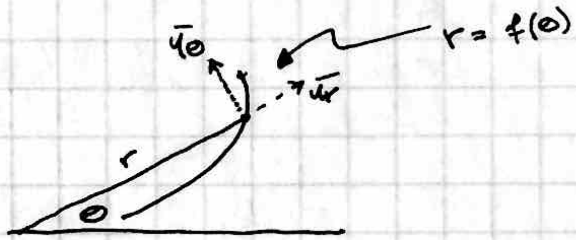

$$\underbrace{r = c \cdot \theta}_{\longrightarrow \text{ ARCHMUDES PRINCIPLE}}$$



$$r = a \cdot e^{b\theta}$$

← DEFINES A CURVE THAT IF YOU PASS WATER THROUGH, IT WOULD EXPERIENCE THE LEAST AMOUNT OF RESISTANCE.

NOTES:




POSITION:

$$\boxed{\vec{r} = r \cdot \bar{u}_r}$$

VELOCITY:

$$\boxed{\bar{v} = \frac{d}{dt}(r) = \frac{d}{dt}(\vec{r} \cdot u_r)}$$

$$\boxed{= \frac{d\vec{r}}{dt}\bar{u}_r + r\frac{d}{dt}(\bar{u}_r)}$$

ACCELERATION:

$$\boxed{\bar{a} = a_r \bar{u}_r + a_\theta \cdot \bar{u}_\theta}$$

FEBRUARY 3, 2012

TEST MATERIAL:

- RECTILINEAR MOTION
- ERRATIC MOTION

WHEN COMPUTING VELOCITY, ALWAYS 'FINISH' PROBLEM BY PLUGGING IN $V_X$ AND $V_Y$ TO SQUARE ROOT

- GRAPHS OF $r(s)$, $v(t)$, $a(t)$
- SPECIFICALLY $a(s) \rightarrow v(s)$, VICE VERSA

$\boxed{\# 12\text{-}57}$

$\boxed{\# 12\text{-}58}$

CURVILLINEAR:

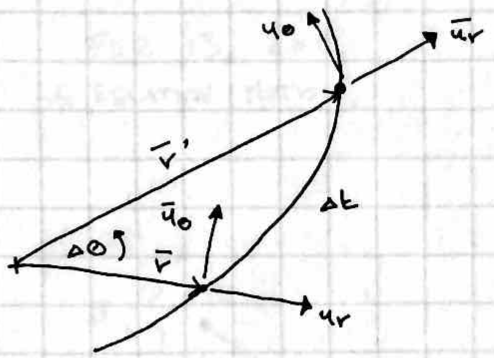
$$\dot{y} = \frac{dy}{dt} = \left(\frac{dy}{dx}\right)\left(\frac{dx}{dt}\right)$$

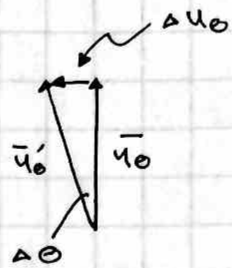
$\frac{dx}{dt} \rightarrow \dot{x}$ (GIVEN)

$\frac{dy}{dx} \rightarrow y = f(x)$

$\downarrow$

$\dot{y} = \frac{dy}{dx}$




$$\bar{u}_\theta' = \bar{u}_\theta + \Delta\bar{u}_\theta$$

$$\Delta\bar{u}_\theta = u_\theta' - \bar{u}_\theta$$

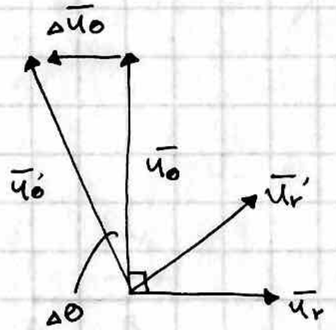
$$\Delta u_\theta = |\Delta v_\theta|$$

$$= |\bar{u}_\theta| \times \Delta\theta$$

$$= 1 \cdot \Delta\theta = \Delta\theta$$

$$\boxed{\Delta u_\theta = \Delta\theta}$$

$$\frac{d}{dt}(\bar{u}_\theta) = \lim_{t \to 0} \frac{\Delta\bar{u}_\theta}{\Delta t} = -\bar{u}_r$$

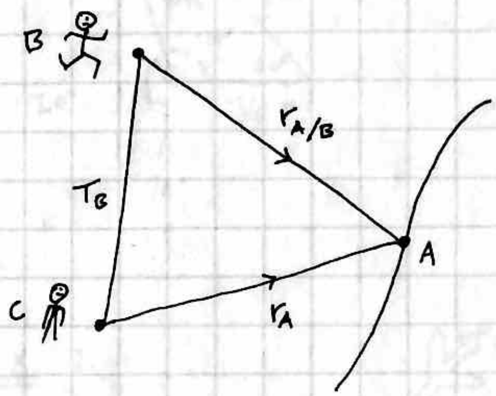


FEB, 8 2012

DEPENDENT MOTION

FEB 13, 2012

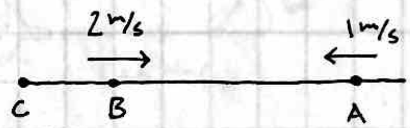
* RELATIVE MOTION




$$r_A = r_B + r_{A/B}$$

$$r_{A/B} = r_A - r_B$$

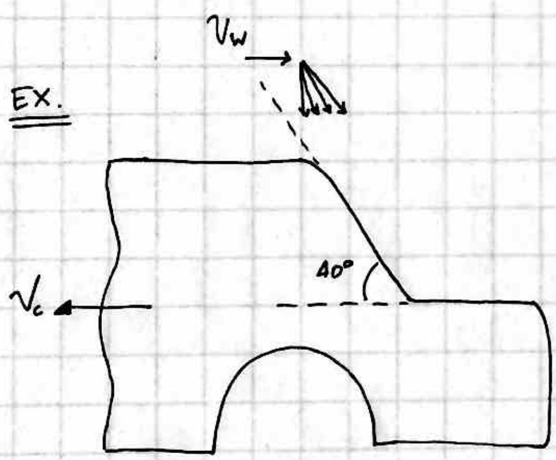
$$\boxed{v_{A/B} = v_A - v_B \qquad a_{A/B} = a_A - a_B}$$

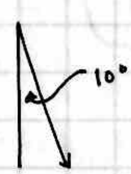


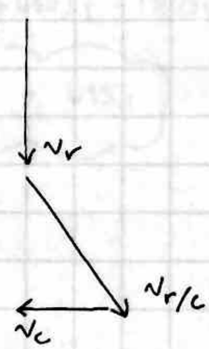

$$v_{A/B} = (-1) - (+2) = \underline{\underline{-3}}$$

$$\boxed{v_{B/A} = -v_{A/B}}$$

<u>EX.</u>




$$\bar{v}_{r/c} = \bar{v}_r - \bar{v}_c$$

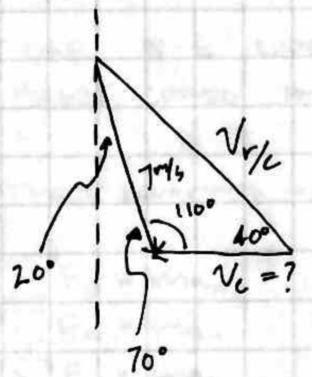
$$\boxed{\begin{gathered}\bar{v}_{r/c} = \bar{v}_r - \bar{v}_c \\ v_r = v_c + v_{r/c}\end{gathered}}$$

MUST MAINTAIN!

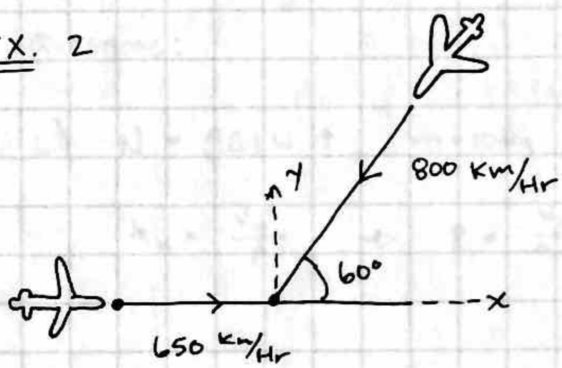
FEBURARY 13, 2012

EX. TAKE 2

$20^\circ$ ANGLE




EX. 2




$$\overline{V_B} = -800\cos(60^\circ)\hat{i} - 800\sin(60^\circ)\hat{j}$$

$$\overline{V_A} = 650\hat{i}$$

$$V_{B/A} = \overline{V_B} - \overline{V_A}$$

$$= (-400 + 650)\hat{i} - (800\sin(60^\circ))\hat{j}$$

$$= 250i - 693j$$

FEB 17, 2012

NORMAL AND TANGENTIAL EQUATIONS OF MOTION

- NORMAL COMPONENT OF FORCE IS ALWAYS ~~TANGENT~~ POINTED TOWARDS THE ~~E~~ CENTER OF CIRCLE

- USE N-t COORDINATED WHEN PARTICLE IS MOVING ALONG A KNOWN CURVED PATH

THREE EQUATIONS OF MOTION:

$$\sum F_b = ma_b$$
$$\sum F_n = ma_n$$
$$\sum F_t = ma_t$$

---

QUESTIONS:

1.) $N = 98.1 N \uparrow$, $m = 10kg$, $V_t = 2 m/s$

$$a_n = \frac{V_t^2}{\rho} \Rightarrow \rho = \frac{V_t^2}{a_n}, \quad \rho = 0.4 m \quad \times$$

2.) ~~W~~ = ~~F_N~~ = $mg = 20 lb$

$$a_n = \frac{V_t^2}{\rho} \quad V_t = (a_n \rho)^{1/2} \Rightarrow V_t = [(10/32.2)(7)]^2 =$$

FEBRUARY

* HW

13.1, 13.4, 13.5, 13.6, 13.12, 13.26, 13.88, 13.89
CAN BE TURNED IN FRIDAY

* CYLINDRICAL COORDINATES

$$v_r = \frac{dr}{dt} = \dot{r}$$

$$v_\theta = r\dot{\theta} =$$

$$a_r = \ddot{r} - r\dot{\theta}^2$$

$$a_\theta = r\ddot{\theta} + 2\dot{r}\dot{\theta}$$

* LOOK AT FIGURE 13.7 IN BOOK
  - STUDY EXAMPLES
  - FUNDEMENTAL PROBLEMS
  - 13.10, 13.11 (EXAMPLES)

FEBRUARY 22, 2012

# MOMENT OF INERTIA

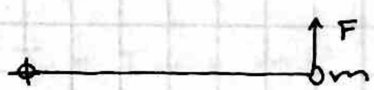
TEST:
- REVIEW HOMEWORKS (SINCE TEST 1)
- FUNDEMENTAL PROBLEMS
- RELATIVE MOTION
- PULLEY PROBLEMS

  12.9, 12.10, 13.1 – 13.6
- RELATIVE MOTIONS, LOM IN CARTESIAN (FROM HW I!)
- ALLOWED ONE NOTESHEET (1 PAGE)

| LINEAR | ROTATIONAL | RELATION |
|---|---|---|
| $s$ | $\theta$ | $s = r\theta$ |
| $v = \dot{s}$ | $\omega = \dot{\theta}$ | $v = r\omega$ |
| $a = \dot{v} = \ddot{s}$ | $\alpha = \dot{\omega} = \ddot{\theta}$ | $a = r\alpha$ |
| $F$ | $\tau$ | $\tau = Fr$ |
| $m$ | $I = mr^2$ | $I = mr^2$ |

N-t SYSTEM:

$a_t = \dot{v}$, $a_n = \frac{v^2}{\rho}$

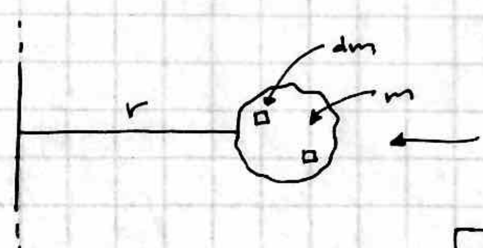



$\boxed{F = m \cdot a}$

$F_t = m \cdot a_t = m\dot{v} = mr\dot{\omega}$

$T = F_t \cdot r = mr^2\dot{\omega} = mr^2\alpha$

$T = (mr^2)\,\alpha$



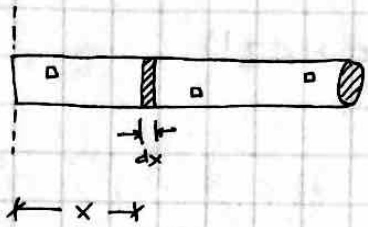

PARTS OF THE MASS ARE AT FURTHER DISTANCES

$$\boxed{I = \int dI = \int r^2\,dm}$$

FEB 22, 2012

TRANSLATE $I = \int_{DOMAIN} r^2 dm \longrightarrow I = mK^2$

$R = \sqrt{\frac{I}{M}} \Rightarrow R = \sqrt{\frac{\int r^2 dm}{M}}$



LENGTH = X

VOLUME:

$dV = A dx$

$dm = \rho dV = A \rho dx$

$dI = dm x^2$, so:

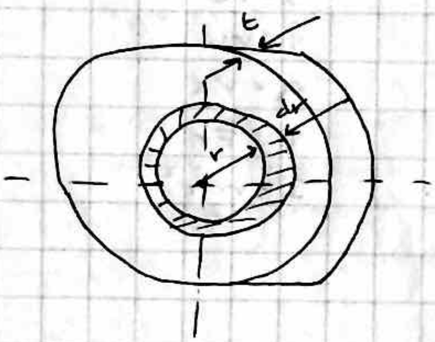
$dI = A\rho x^2 dx$

$I = A\rho \int_0^L x^2 dx$

$= A\rho \frac{L^3}{3}$

$= (AL\rho)\frac{L^2}{3}$

$\boxed{I = \frac{mL^2}{3}}$



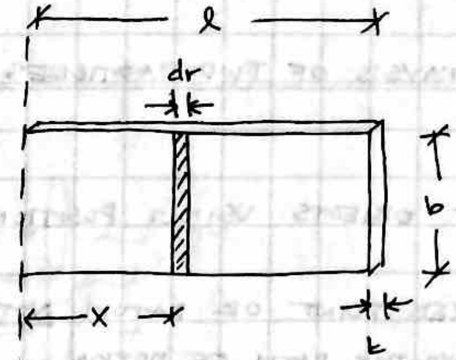
$dI = r^2 dm$

$= 2\pi t r^3 dr$

$I = 2\pi t \rho \frac{R^4}{4}$

$= (\pi r^2) t \rho \cdot \frac{R^2}{2}$

$= \frac{mR^2}{2}$




$V = lbt$

$dm = \rho\, dV = A\,dx$

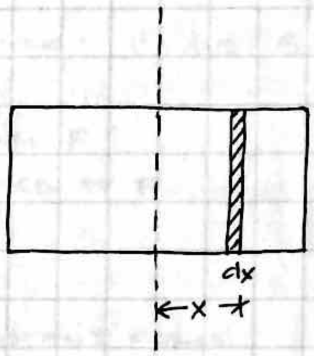
$$\underbrace{I = \frac{mL^2}{3}}$$

SAME AS BAR ABOUT END

$\underbrace{\rho t b\,dx}_{m} \Rightarrow dI = x^2 \rho t b\,dx$

$I = \rho t b \left[\frac{x^3}{3}\right]_0^L$

$I = \rho t b \left[\frac{L^3}{3}\right]$




$I = \frac{ML^2}{12}$

dx

$dA = b \cdot dx$

$dV = bt\,dx$

$dm = \rho bt\,dx$

$dI = x^2\,dm$

$= x^2 \rho bt\,dx$

$I = \rho bt \frac{1}{3} [$

PARRALLEL AXIS THEORUM

$I_d = I_{cm} + md^2$

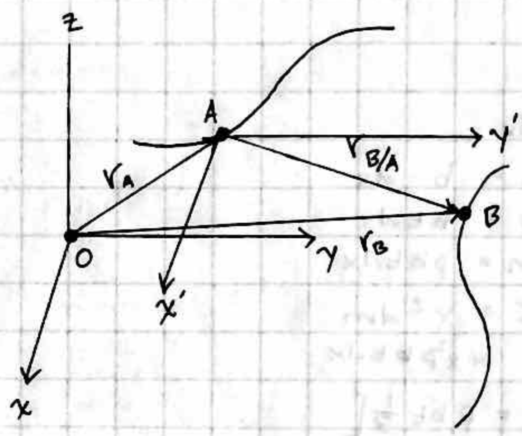
<u>KNOW HOW TO COMPUTE MOI</u>

NOTES, CHAPTER 12.9 READING

* ABSOLUTE DEPENDENT MOTION ANAYSIS OF TWO PARTICLES

- SPECIIFY LOCATION OF DEPENDENT OBJECTS USING POSITION COORDINATES.
- MUST BE MEASURED FROM A FIXED POINT OR DATUM, NOT NECCESARILY THE SAME, BUT ALONG THE PATH OF MOTION

* RELATIVE MOTION OF TWO PARTICLES USING TRANSLATING AXES




POSITION:

$$r_B = r_A + r_{B/A}$$

VELOCITY:

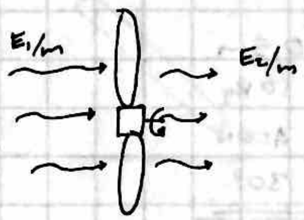
$$v_B = v_A + v_{B/A}$$

ACCELERATION:

$$a_B = a_A + a_{B/A}$$

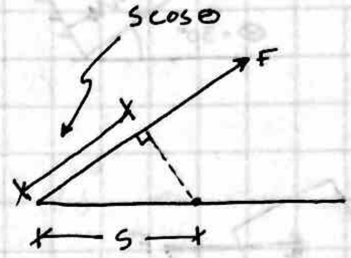
FEBRUARY 27, 2012

## * WORK AND ENERGY




WORK:

$W = \bar{F} \cdot \bar{s} = Fs\cos\theta$

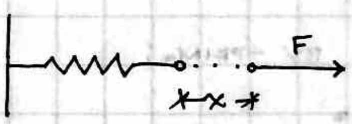



$\Rightarrow F.s\cos\theta$

* POSITIVE WORK : F AND S ARE IN SAME DIRECTION

(+) ALONG F
(−) OPPOSED TO F

## * NON-CONSTANT FORCE




$F = kx$

$x \;\ldots\; F$

$x + dx \;\ldots\; F + dF \Rightarrow dW \Rightarrow Fx + Fdx + xdF + \cancel{dFdx}^{\,0}$

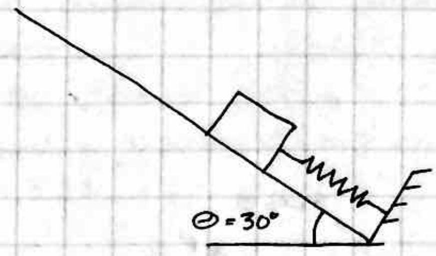
$dW = (F + dF)(dx) \Rightarrow Fdx + \cancel{dFdx}^{\,0} \Rightarrow Fdx \Rightarrow F = kx$

$$W = k\int_{x_1}^{x_2} x\,dx \Rightarrow \frac{kx_2^2}{2} - \frac{kx_1^2}{2} \qquad \boxed{W = \frac{kx_2^2}{2} - \frac{kx_1^2}{2}}$$

− MUST PAY ATTENTION TO INITIAL DISPLACEMENT WITH SPRINGS.

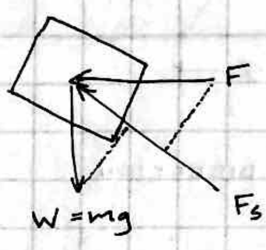
2/27/2012 CONT.

EX:




$S_1 = 0.5m$
$m = 10kg$
$F = 400N$
$\theta = 30°$

$W = ?$
$\Delta S = 2m$




WORK DONE BY F:

$$(F\cos(30))(2m)$$
$$= 400\cos(30)N \cdot 2m = 692.8N$$

WORK DONE BY mg

$$W = -(mg\sin\theta)\cdot S$$
$$= (10)(9.81)(0.5) \Rightarrow -98.1$$

WORK DONE BY SPRING:

$$\frac{Kx_2^2}{2} - \frac{Kx_1^2}{2} \Rightarrow -90J$$

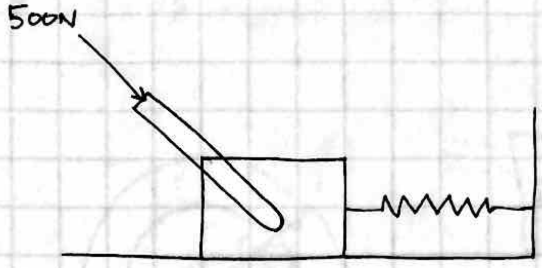
TOTAL WORK:

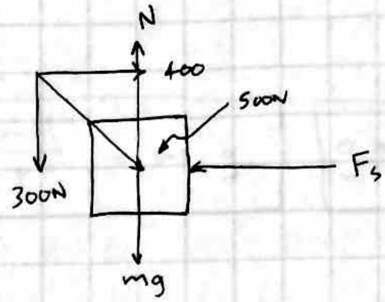
$$\sum W \Rightarrow (692.8 - 98.1 - 90)\,J$$

* NOTE *

IF SPRING WERE LET TO OCCILATE, IT WOULD OCCILATE AROUND LOADED EQUILLIBRIUM.

2/29/2012

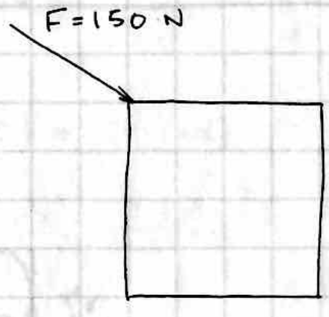



$\sum F_x = 400N - kx$

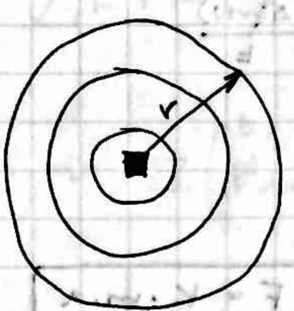
$\frac{400N - 500x}{10}$ ⇒ "$a = f(s)$" ⇒ INTEGRATE TO GET v

Ex.



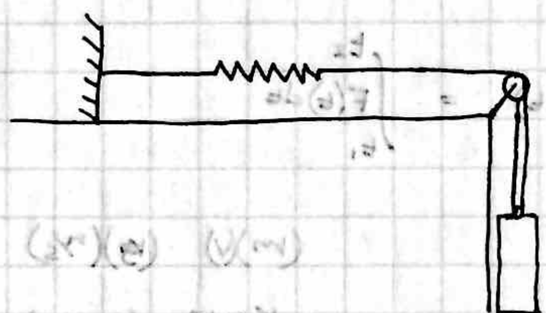

$\sum F_x$ : $150\cos(\theta)$

~~2/2~~ 3/2/2012




$$\boxed{F_g = G\frac{mM}{r^2} = m\cdot g} \quad \boxed{g = \frac{GM}{r^2}}$$

Ex.



$W_s = \frac{1}{2}K(x_2^2 - x_1^2)$

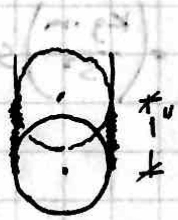
$F_{s1} = 60N$

$K_s = 300\ N/m$

$x_1 = \frac{F_{s1}}{K} = \frac{60N}{300\ N/m} = \underline{\underline{0.2m}}$

$W_g = mg(\Delta h) = (50kg)(9.81\ m/s^2)(0.2m)$

$W_g =$




PULLY MOVES 1" FOR EVERY <u>2"</u> OF ROPE DISPLACED

3/5/2012

$V_1$, $V_2$, $t$

$a = \frac{V_2 - V_1}{t} \Rightarrow ma = \frac{mV_2 - mV_1}{t} \quad \frac{\Delta(mv)}{t}$

= RATE OF CHANGE OF MOMENTUM

$F \propto \frac{\Delta mv}{t} \Rightarrow F = \frac{m(V_2 - V_1)}{t} \Rightarrow \boxed{F = K \cdot m \cdot a}$

1 N 1 Kg $1\,m/s^2$

SO K MUST BE 1

$m \cdot v = I = \int F \cdot dt = F(\Delta t) = \int_{t_1}^{t_2} F(t)\,dt$

$(m)(v) \quad (kg)(m/s)$

$\frac{kg \cdot m}{s} = \left(\frac{kg \cdot m}{s^2}\right) s$

FINAL REVIEW NEXT FRIDAY

TEST #3 NEXT WEDNESDAY

IMPULSE IS A NON-CONSERVATIVE FORCE

(DIFFERENT THAN ENERGY)

CHAPTER 15

IMPULSE AND MOMENTUM:

$$\sum F = m\vec{a} = m\frac{d\vec{v}}{dt} \Rightarrow \sum \int_{t_1}^{t_2} \vec{F}\,dt = m\int_{v_1}^{v_2} dv$$

$$\Rightarrow \sum \int_{t_1}^{t_2} \vec{F}\,dt = mv_2 - mv_1$$

$$\Rightarrow \boxed{mv_1 + \sum \int_{t_1}^{t_2} F\,dt = mv_2}$$

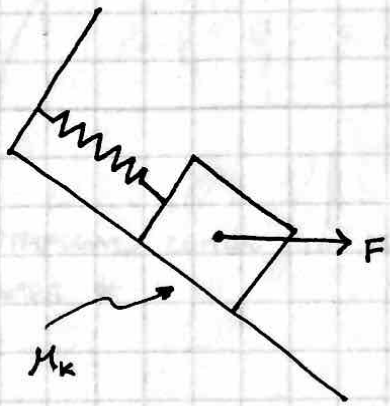
* PRINCIPLE OF LINEAR IMPULSE AND MOMENTUM *

3/12/2012

TEST : ALL 14, 15.1,2,3 . 2/3 PROBLEM

- SPRING
- GRAVITY
- FORCE

$\left.\begin{array}{l} \\ \\ \\ \end{array}\right\}$ PROBLEMS




PROFESSOR RECCOMENDED STARING DOWN BARREL OF GUN...

FIND VELOCITY AT $t = 1s$

* ANGLE OF REPOSE