Physics 113 - October 10, 2013

- Exam 1 graded
- Will hand back at end of class

more on this later
give me 10 min. warning

- P.S due Friday
- Workshops next week

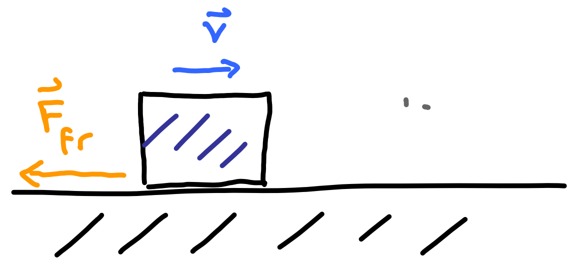
Last Week

Friction

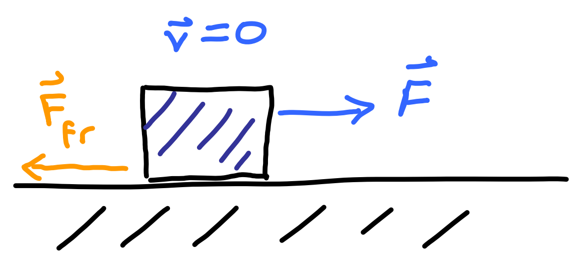
$|\vec{F}_{Fr}| = \mu_k |\vec{N}|$

$|\vec{F}_{Fr}| \leq \mu_s |\vec{N}|$

Look for indication of "threshold"

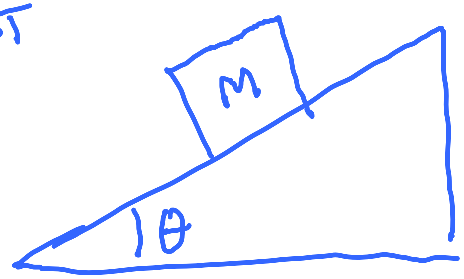


Force of friction opposes the motion



Force of friction opposes the net force

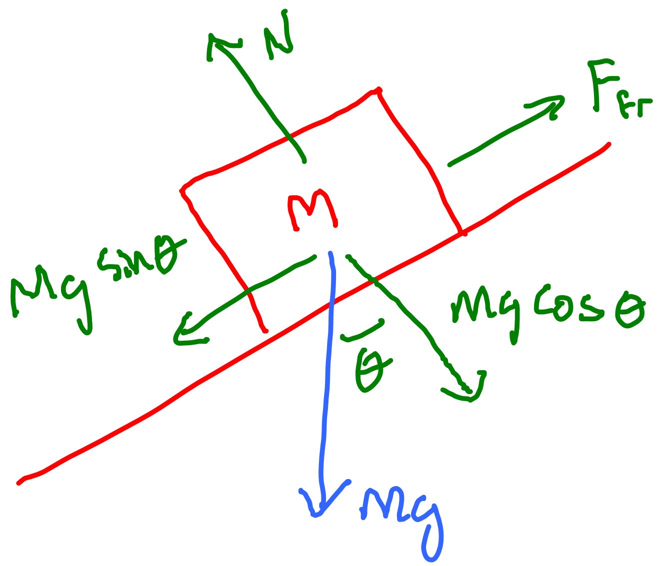
M at rest



μ_s, μ_k

what is $|F_{Fr}|$ on mass?

I	$Mg\sin\theta$	1
II	$\mu_s Mg\cos\theta$	20
III	$\mu_s Mg\sin\theta$	30
IV	$\mu_k Mg\cos\theta$	1
V	$\mu_k Mg\sin\theta$	2



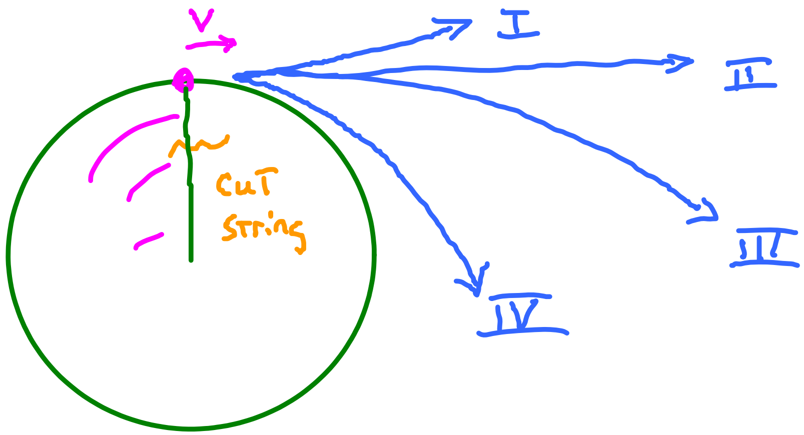
$N = Mg\cos\theta$

$Mg\sin\theta = F_{fr}$

Maximal F_{fr} would be

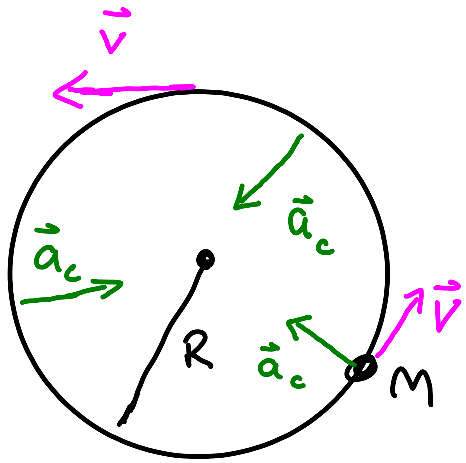
$\mu_s N = \mu_s Mg\cos\theta$

Ans. = I or II depending on details of problem



Which path best describes subsequent motion of object?

circular motion



Circular Motion

$$|\vec{a}_c| = \frac{|\vec{v}|^2}{R}$$

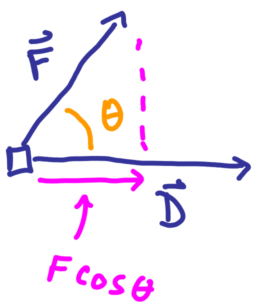
$F = Ma$

centripetal force

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

circular motion impt

Work + Energy



Work $= |\vec{F}||\vec{D}|\cos\theta$

Woohoo!

You can have Negative Work!!

Work = (Force)(Distance moved along direction of that Force)

- or -

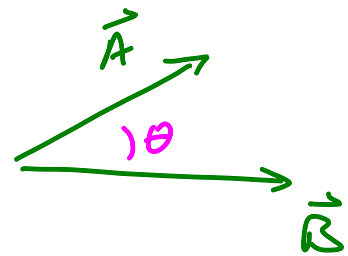
Work = (Magnitude of force component along Direction of Movement)(Distance moved)

Energy = Ability to do work

Energy = Work

1 Joule = 1 Newton-meter

Scalar ("Dot") Product



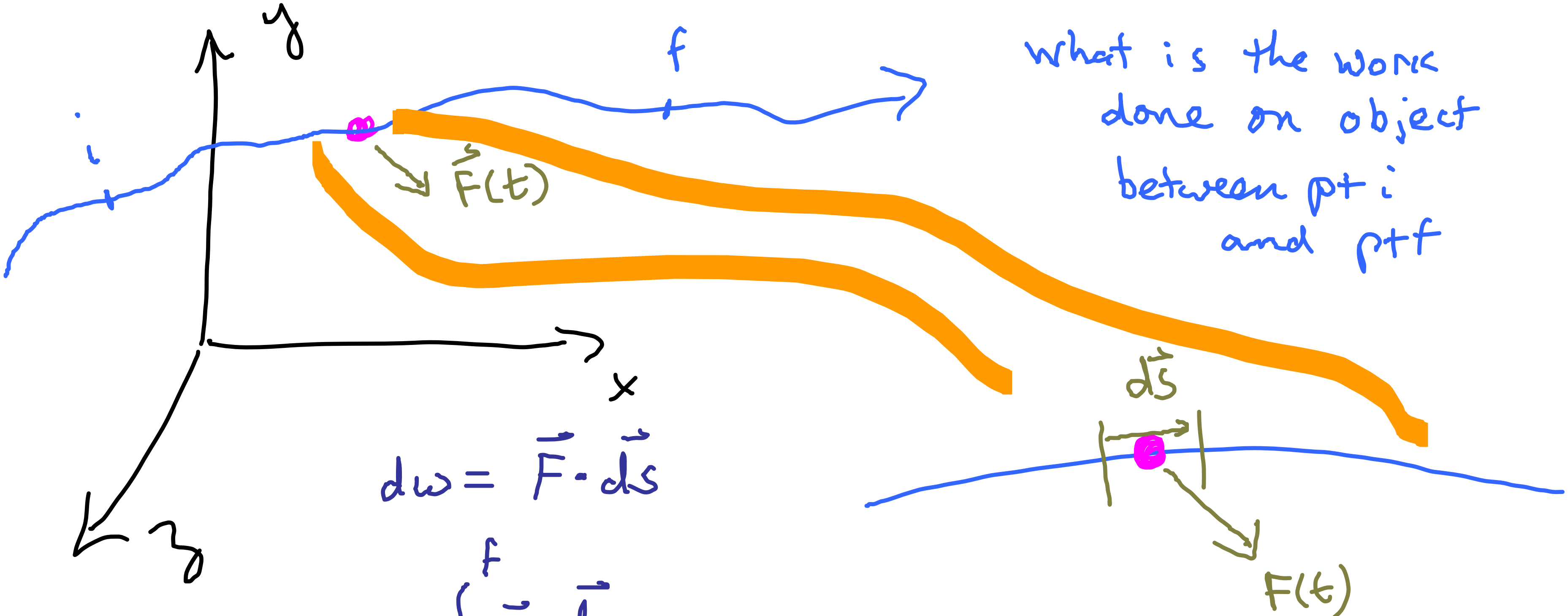
$$\vec{A}\cdot\vec{B} = |\vec{A}||\vec{B}|\cos\theta$$

$$= \vec{B}\cdot\vec{A}$$

projects out magnitude of one vector along other and multiplies it by mag. of the other.

Two vectors ➡ a Number

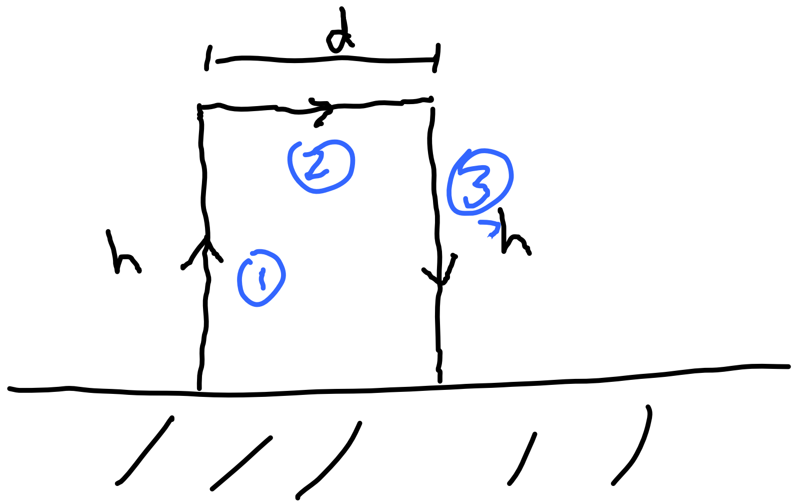
$$\vec{A}\cdot\vec{B} = A_x B_x + A_y B_y + A_z B_z$$



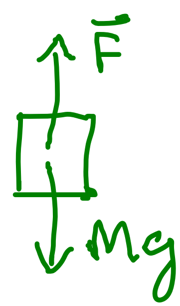
what is the work done on object between pt i and pt f

$$dw = \vec{F} \cdot \vec{ds}$$

$$W_{i \to f} = \int_i^f \vec{F} \cdot \vec{ds}$$



what is the work done by climber on the backpack in each segment of the climb --- and what is the total work done?



$$\int \vec{F}\cdot d\vec{s} = \int_{1} \vec{F}\cdot d\vec{s} + \underbrace{\int_{2} \vec{F}\cdot d\vec{s}}_{0 \quad F_{\perp} d\vec{s}} + \int_{3} \vec{F}\cdot d\vec{s}$$

$\uparrow F$

$\downarrow Mg$ $\quad |F| = mg$

$d\vec{s} \uparrow$ $\qquad \vec{F}\cdot d\vec{s} = F\,ds$

$$\int_{1} \vec{F}\cdot d\vec{s} = \int_0^h F\,ds = mgh$$

$\uparrow \vec{F}$

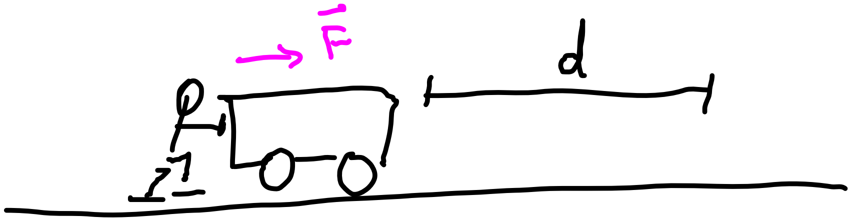
$\downarrow d\vec{s}$

$$\int \vec{F}\cdot d\vec{s} = -mgh$$

Total work = $mgh + 0 + (-mgh) = 0$

No net work ... No change in height (and no energy loss elsewhere in this problem)

gravity is a "Conservative" force



Start from rest, Frictionless

$F = ma$

$W = Fd$

const a eqn

$$v^2 = v_0^2 + 2ad$$

$$v^2 = 2ad = 2\frac{Fd}{M}$$

W

Energy $\equiv W = \frac{1}{2}mv^2$

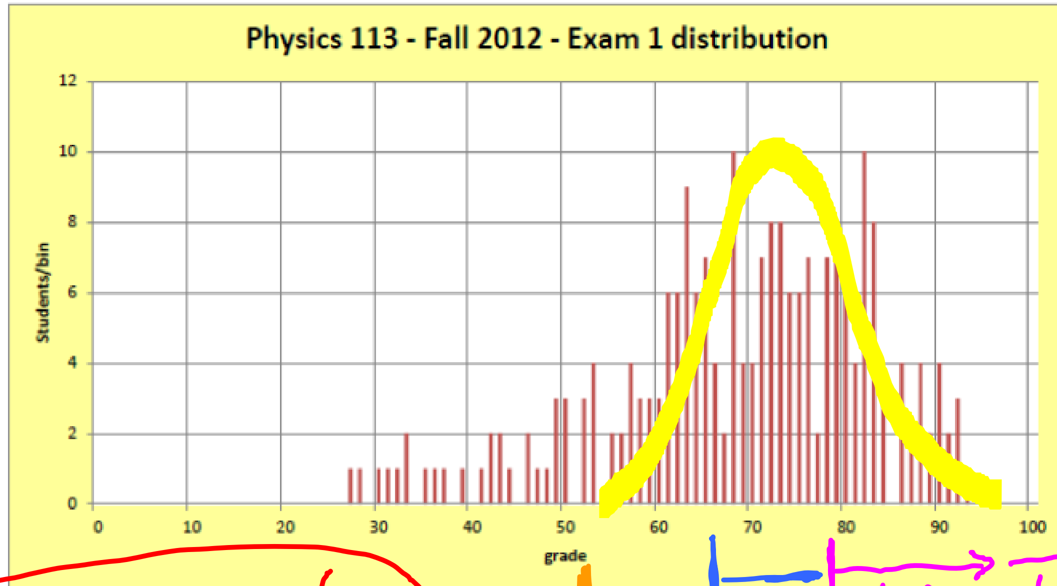
. .

Energy of Motion

Kinetic Energy

$\equiv \frac{1}{2}mv^2$

- Syllabus allows for a bad day
- Previous grade indicator of next grade if you do nothing.
- Regrades



222 Took exam
mean = 69
Median = 71

Please remove exam + leave envelope here for re use.

Something is very Broken. Big + immediate change required current holes will bite you

Something in your approach/studying is NOT working well. Major holes in understanding here. Now is time to fix

you are getting it ... are you making silly errors? Or do you have holes that ought not be there (that can be prevented in future by changes in Study pattern)?

Woohoo! Whatever you are doing it is working