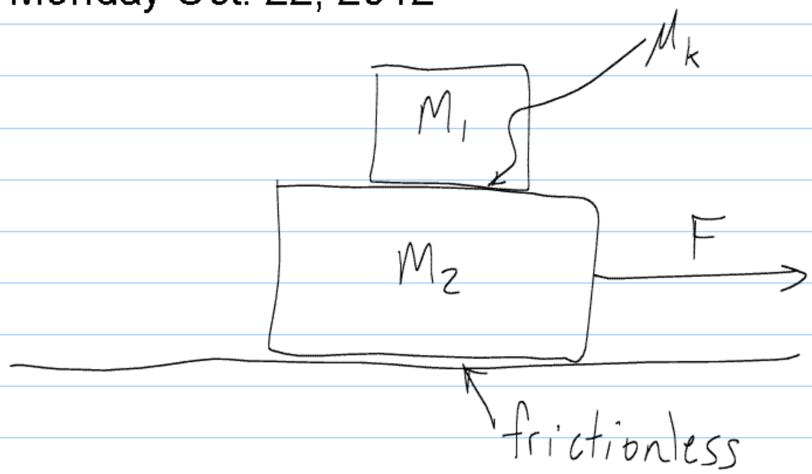
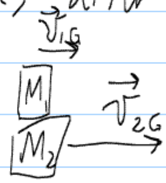
PHY131H1F Centre-screen notes
Monday Oct. 22, 2012



M_2 will accelerate toward the right.

Instantaneous velocites after some short time:

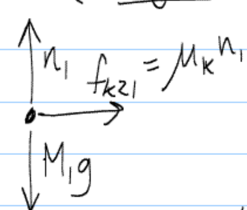


$v_{2G} > v_{1G}$

$\Rightarrow \vec{v}_{12}$ is towards the <u>left</u>

$\Rightarrow \vec{f}_k$ on M_1 is to the <u>right</u>.

f.b.d. of M_1 :

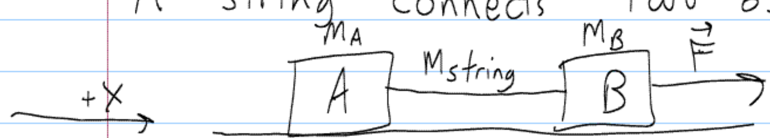


<u>Note</u>: By Newton's 3rd Law, there will be 2 reaction forces on M_2.

n_1 will act down on M_2

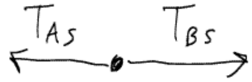
f_k will act to the left on M_2

A string connects two objects A & B.



All 3 objects accelerate to the right: $\vec{a} = +a_x$

f.b.d. of string



$$(F_{Net})_x = T_{Bs} - T_{As} = \cancel{m_{string}\, a_x} \; 0$$

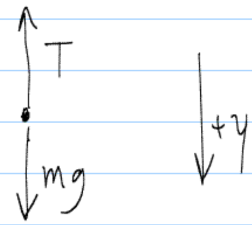
If $m_{string} \to 0$, Then $T_{Bs} - T_{As} \to 0$

$$T_{Bs} = T_{As} = T$$

Tension is fixed along a massless string.

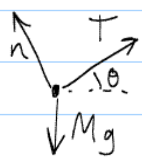
Two objects, so two fbd's

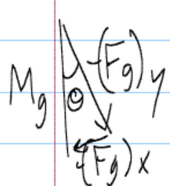
f.b.d. for m:



f.b.d. for M:

neglect friction on cart.





	x	y
$\vec{T}$	T	0
$\vec{n}$	0	n
$M\vec{g}$	$-Mg\sin\theta$	$-Mg\cos\theta$
$\vec{F}_{Net}$		

$$(F_{Net})_x = T - Mg\sin\theta = Ma_x$$

$a_y = 0 \longrightarrow (F_{Net})_y = n - Mg\cos\theta = 0$

$$a_x = \frac{T - Mg\sin\theta}{M}$$

a_x for M $= a_y$ for m since they are connected.

don't know T...

hanging mass: $(F_{Net})_y = mg - T = ma_y$

$$T = mg - ma$$

Solve for T in M case;

$$T = Ma + Mg\sin\theta$$

Set $T = T$ to eliminate T

solve for a, acceleration of either M or m.

$$Ma + Mg\sin\theta = mg - ma$$

Solve for a;

$$Ma + ma = mg - Mg\sin\theta$$

$$(M+m)a = \text{— '' —}$$

$$a = \frac{mg - Mg\sin\theta}{M+m}$$

$$\boxed{a = g\left(\frac{m - M\sin\theta}{M+m}\right)}$$

Can be <0, $=0$ or >0, depending on θ.

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fbd for hanging mass:

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

down

$mg > T$