



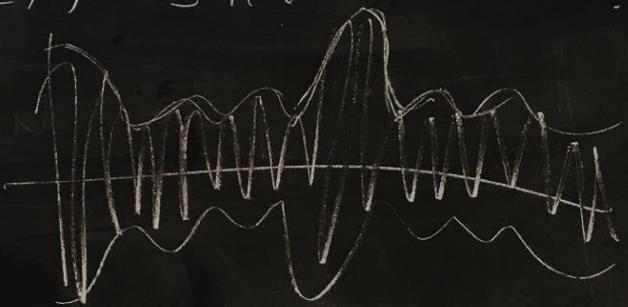
# Closing Ceremony & Reception June 7, 2017

$$\omega_n = n\omega_0$$

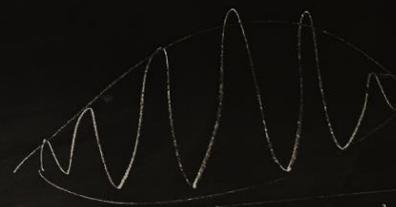
$$\omega = n\omega_0$$

$$\omega_n = (2n-1)^2$$

$$\sin(kx) + \sin(1.01kx) + \sin(1.015kx)$$



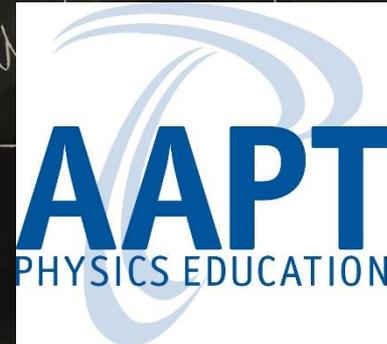
$$\sin(k_1x) + \sin(k_2x)$$



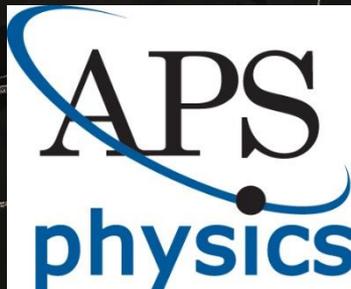
draw motion period?

$\Delta k$	$\approx$	$1$
$\Delta x$	$\approx$	$1$
$\Delta \omega$	$\approx$	$1$

# Member Societies



American Astronomical Society



The Society of Rheology

# US Physics Team Sponsors

**Beloit**



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# Reception Sponsors



**GEPETTO CATERING**

# Physics Team Coaches



Paul Stanley – Director

Jiajia Dong – Senior Coach

Mark Eichenlaub – Coach

Dave Fallest – Senior Coach

Mike Winer - Coach

Kevin Zhou - Coach



# 2017 U.S. Physics Team



$k = \frac{n\pi}{L}$   
 $\omega = \frac{n\pi v}{L}$   
 $k = \frac{n\pi}{L}$   
 $\omega = \frac{n\pi v}{L}$   
 $k = (2n-1)\frac{\pi}{2L}$   
 $\omega = vk$   
 $\sin$   
 $\Delta x$   
 $\Delta x$   
 $\Delta x$   
 $\Delta w$

# Physics Team Members



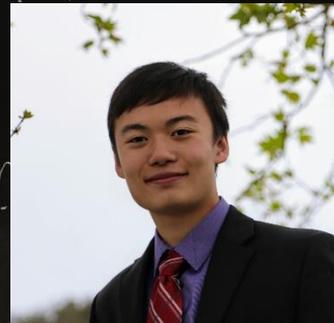
Shreyas Balaji



Mike Bao



Edward Cen



Phil Chen

$$k = \frac{n\pi}{L}$$
$$\omega = \frac{v\pi n}{L}$$
$$\omega_n = n\omega_0$$

$$k = (2n-1)\frac{\pi}{2L}$$
$$\omega = vk$$
$$\omega = (2n-1)\frac{v\pi}{2L}$$
$$\omega_n = (2n-1)^2$$

$$\sin(kx - \omega t)$$
$$+ \sin(1.01kx) + \sin(\dots)$$
$$\Delta x$$
$$\Delta kx$$
$$\Delta x$$
$$\Delta \omega \approx 1$$

$$\sin(kx) + \sin(\dots)$$


draw motion period?

# Physics Team Members



Matthew Guo



Tiffany Huang



Kiran Linsuain



Steven Liu

Background chalkboard content:

- Top left:  $k = \frac{n\pi}{L}$ ,  $\omega = \frac{n\pi v}{L}$ ,  $\omega_n = n\omega_0$
- Top right:  $k = \frac{(2n-1)\pi}{2L}$ ,  $\omega = vk$ ,  $\omega = \frac{(2n-1)v}{2L}$ ,  $\omega_n = \frac{(2n-1)^2}{2}$
- Middle:  $\sin(kx - \omega t)$
- Bottom left:  $\Delta x$ ,  $\Delta kx$ ,  $\Delta x^2$ ,  $\Delta x^3$ ,  $\Delta \omega \approx 1$
- Bottom right:  $\sin(kx) + \sin(\dots)$ , a hand-drawn wave graph, and the text "draw motion period?"

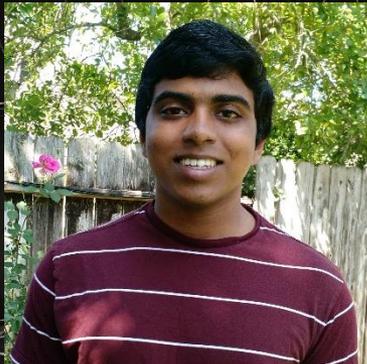
# Physics Team Members



Faraz Masroor



Srijon Mujherjee



Pranav Murugan



Anthony Ou

$$k = \frac{n\pi}{L}$$
$$k = \frac{n\pi}{L}$$
$$k = (2n-1)\frac{\pi}{2L}$$
$$\omega = vk$$
$$\omega = (2n-1)\frac{v\pi}{2L}$$
$$\omega_n = (2n-1)\frac{v\pi}{2L}$$

$$k = \frac{n\pi}{L}$$
$$\omega = \frac{v\pi n}{L}$$
$$\omega_n = n\omega_0$$

$$\sin(kx) + \sin(1.01kx) + \sin(1.02kx)$$
$$\Delta x$$
$$\Delta kx$$
$$\Delta x$$
$$\Delta \omega \approx 1$$

$$\sin(kx) + \sin(1.01kx) + \sin(1.02kx)$$


draw motion period?

# Physics Team Members



Aditya Parulekar



Jimmy Qin



Sanjay Raman



Kye Shi

$$k = \frac{n\pi}{L}$$
$$k = \frac{n\pi}{L}$$
$$k = (2n-1)\frac{\pi}{2L}$$
$$w = vk$$
$$w = (2n-1)$$
$$w_n = (2n-1)^2$$

$$\sin(kx) + \sin(1.01kx) + \sin(\dots)$$
$$\sin(1.01kx) + \sin(\dots)$$
$$\Delta x \approx 1$$
$$\Delta k \approx 1$$
$$\Delta x \approx 1$$
$$\Delta \omega \approx 1$$

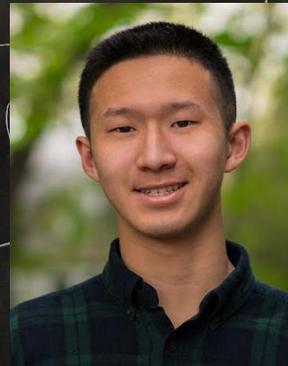
$$\sin(k, x) + \sin(\dots)$$

draw motion period?

# Physics Team Members



Michelle Song



Andrew Wang

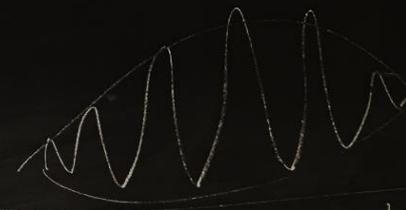


Handong Wang

$$\sin(k_1 x - \omega_1 t) + \sin(1.01 k x) + \sin(1.015 k x)$$



$$\sin(k_1 x) + \sin(k_2 x)$$



draw motion period?

Background chalkboard content for the top row:

- Equations:  $k = \frac{n\pi}{L}$ ,  $\omega = \frac{n\pi v}{L}$ ,  $\omega_n = n\omega_0$ ,  $k = \frac{(2n-1)\pi}{2L}$ ,  $\omega = vk$ ,  $\omega = \frac{(2n-1)\pi v}{2L}$ ,  $\omega_n = \frac{(2n-1)^2 \pi^2 v}{4L^2}$
- Text:  $n=0, L$ ,  $\sin(\omega t)$ ,  $\omega's$

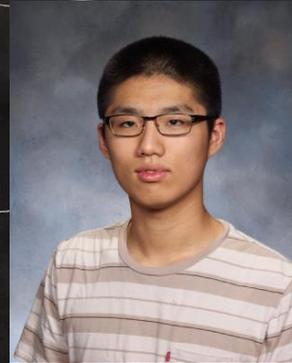
Background chalkboard content for the bottom row:

- Equations:  $\Delta x$ ,  $\Delta k \propto \Delta x$ ,  $\Delta \omega \propto \Delta x$
- Text:  $\sin(k_1 x - \omega_1 t)$

# Physics Team Members



Catherine Wu



Haobang Yang

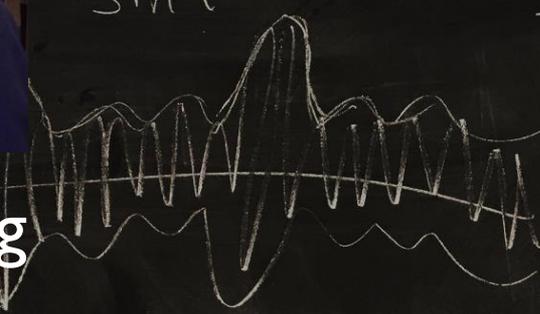


Jerry Zhang

$$k = \frac{n\pi}{L}$$
$$\omega = \frac{n\pi v}{L}$$
$$\omega_n = n\omega_0$$

$$k = \frac{n\pi}{L}$$
$$\omega = \frac{n\pi v}{L}$$

$$k = (2n-1)\frac{\pi}{2L}$$
$$\omega = vk$$
$$\omega = (2n-1)\frac{\pi v}{2L}$$
$$\omega_n = (2n-1)^2$$

$$\sin(k_1 x - \omega_1 t) + \sin(1.01 k x) + \sin(1.015 k x)$$


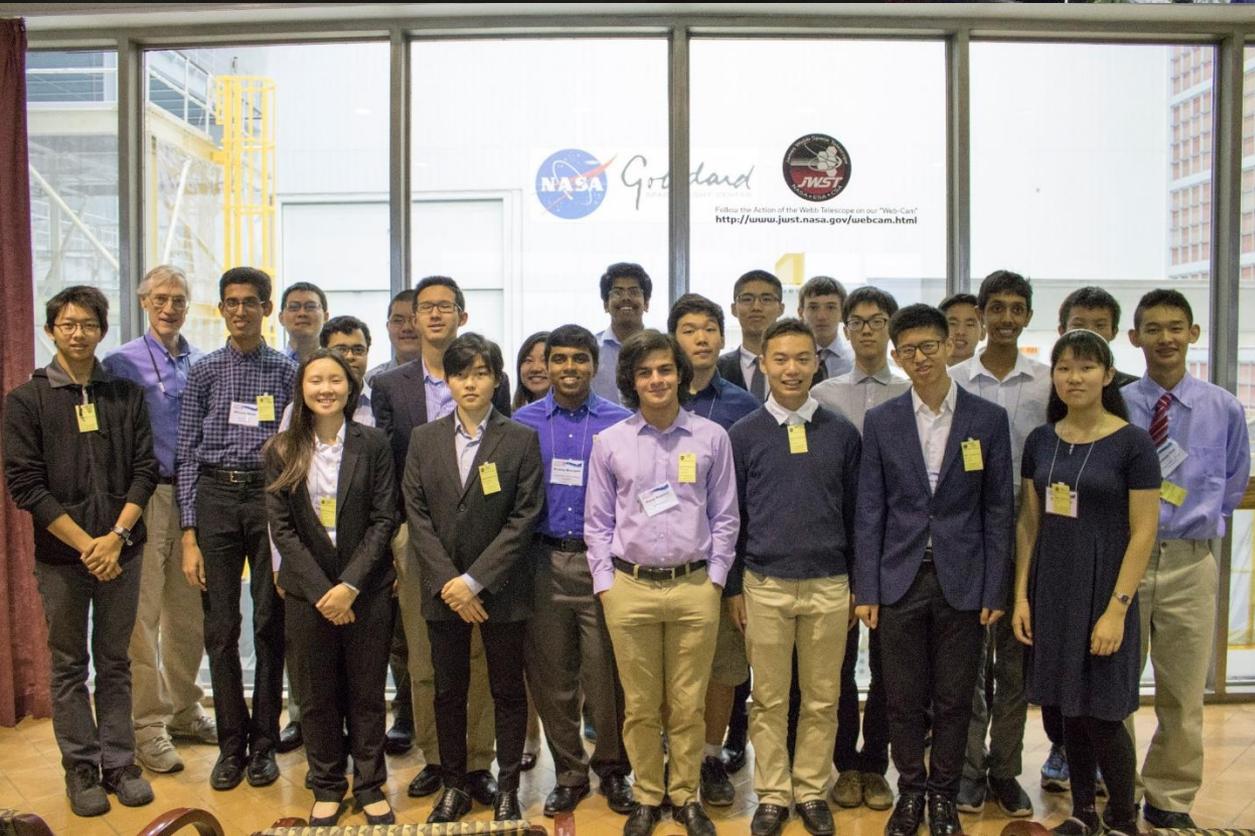
$$\sin(k_1 x) + \sin(k_2 x)$$

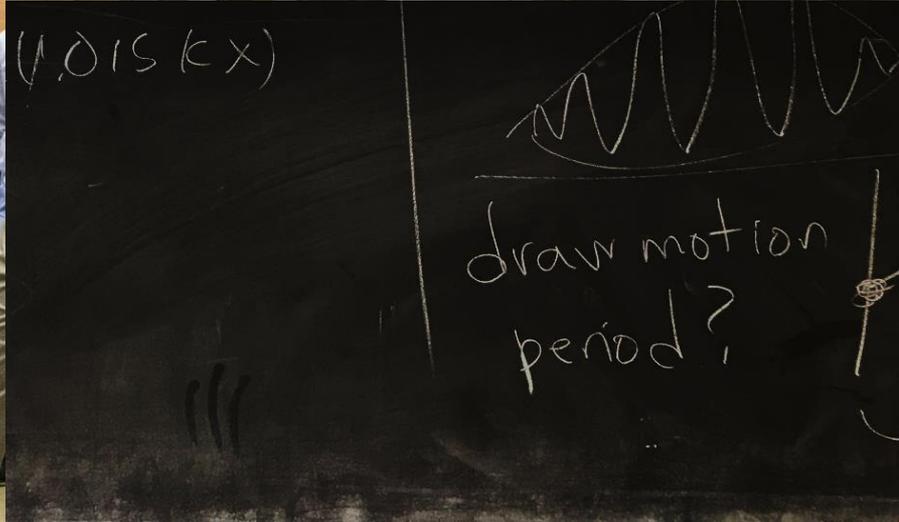
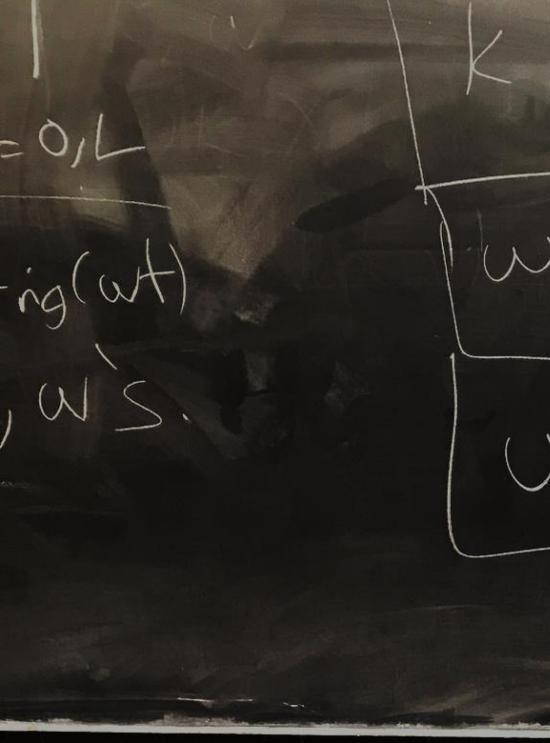

draw motion period?

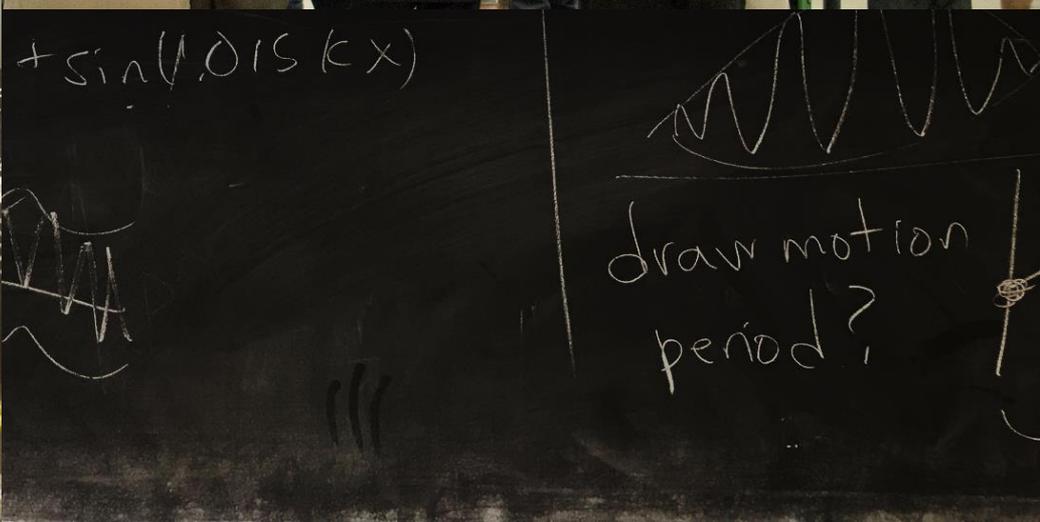
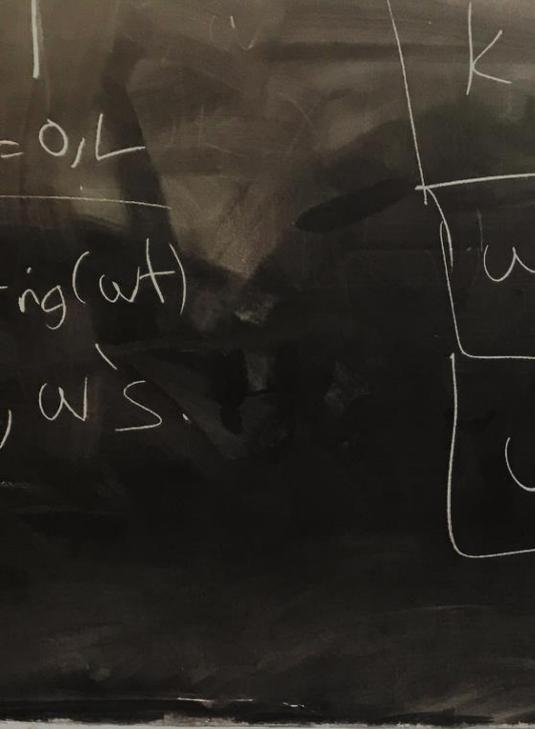
# NASA Tour

$\sin(\omega t)$   
 $\omega$ 's.

$$k = \frac{n\pi}{L}$$
$$\omega = \frac{n\pi v}{L}$$
$$\omega_n = n\omega_0$$









$$\left. \begin{aligned} &= \frac{n\pi}{L} \\ &= n\omega_0 \end{aligned} \right\} \begin{aligned} k &= (2n-1)\frac{\pi}{2L} \\ \omega &= vk \\ \omega &= \frac{(2n-1)v}{2L} \\ \omega_n &= \frac{(2n-1)v}{2L} \end{aligned}$$

$$\Delta x$$

$$\sin(kx) + \sin(1.01kx) + \dots$$

$$\Delta kx$$

$$\Delta x \approx 1$$

$$\Delta \omega \approx 1$$



# Opening Reception

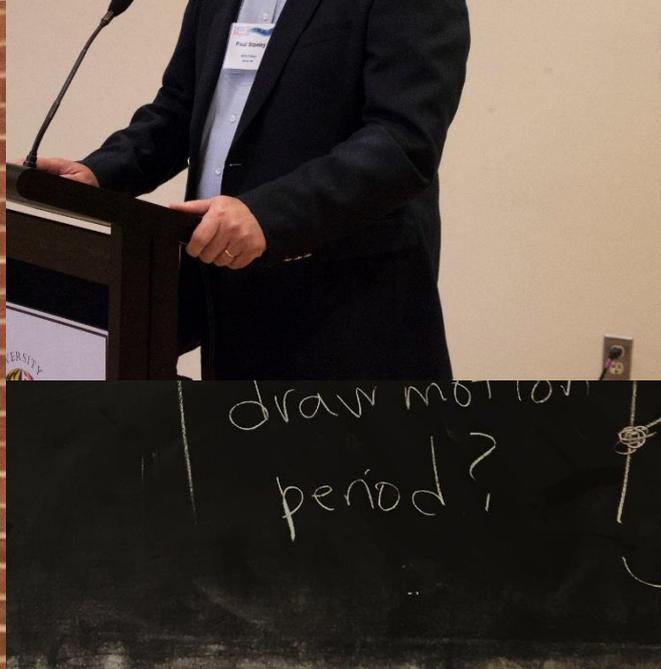




$$\begin{aligned} &= \frac{n}{L} \\ &= \frac{n \pi v}{L} \\ &= n \omega_0 \end{aligned}$$
$$\left[ \omega = (2n-1) \frac{\pi}{2L} \right]$$
$$\omega = vk$$
$$\omega = \frac{(2n-1)}{(2n-1)^2}$$



$$\Delta x$$
$$\Delta k x$$
$$\Delta x \approx$$
$$\Delta \omega \approx$$



# UMD Physics Dept

Our current view of underlying structure of matter

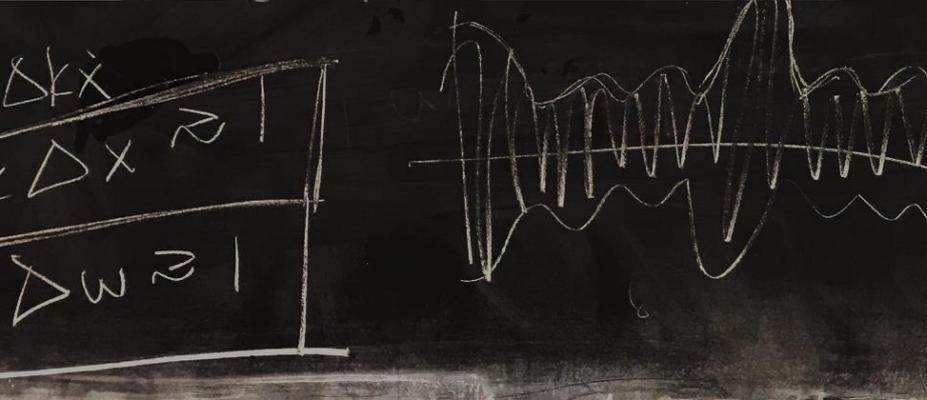
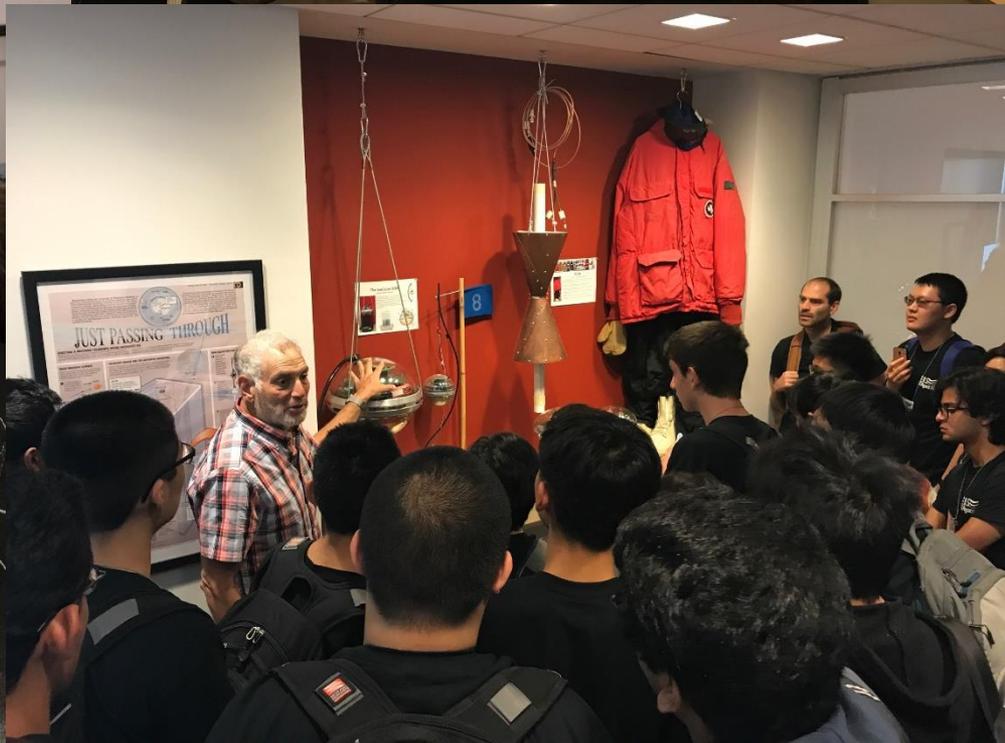
The Periodic Table of Elementary Particles and Forces

Three Generations of Matter (Fermions)

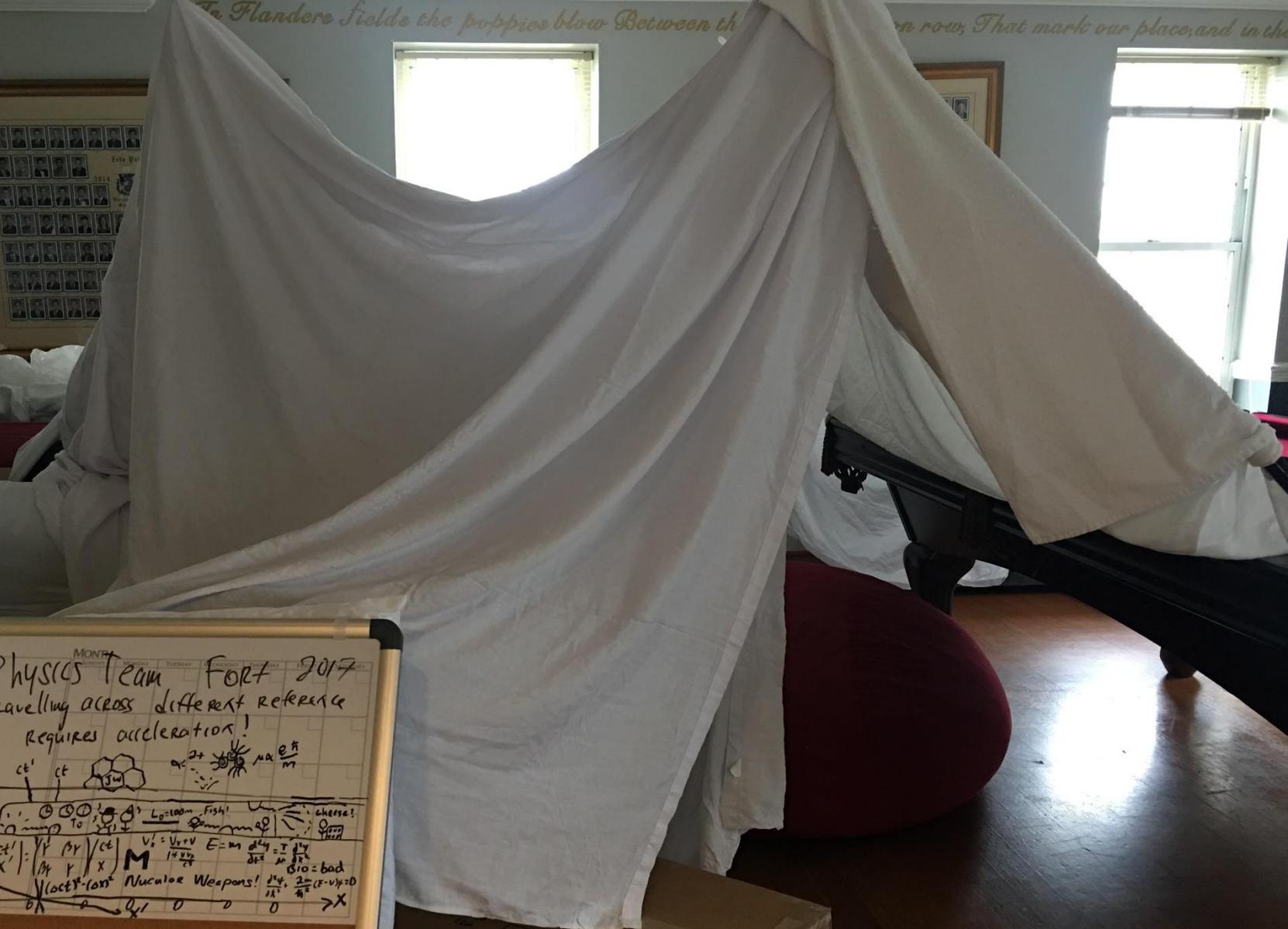
	I	II	III	IV
matter	u	c	t	$\gamma$
charge	2/3	2/3	2/3	0
spin	1/2	1/2	1/2	1
name	up	charm	top	photon
	d	s	b	g
Quarks	down	strange	bottom	gluon
	$\nu_e$	$\nu_\mu$	$\nu_\tau$	Z
Neutrinos	electron neutrino	muon neutrino	tau neutrino	weak boson
	e	$\mu$	$\tau$	W
	electron	muon	tau	weak boson
				H
				Higgs boson



J. Goodman — Particle Astrophysics — Univ. of Maryland



Flanders fields the poppies low Between the rows, That mark our place, and in the



# USA Physics Team Fort 2017

Warning: travelling across different reference frames requires acceleration!

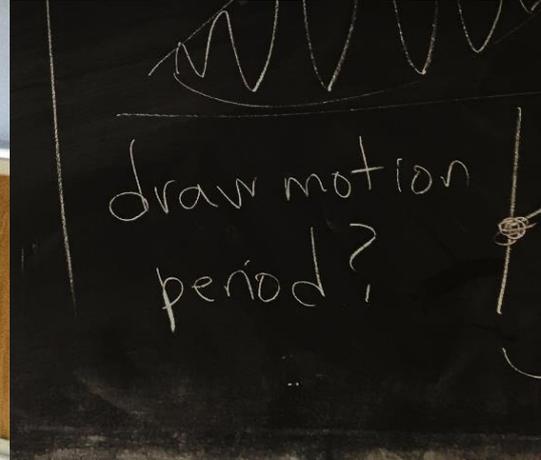
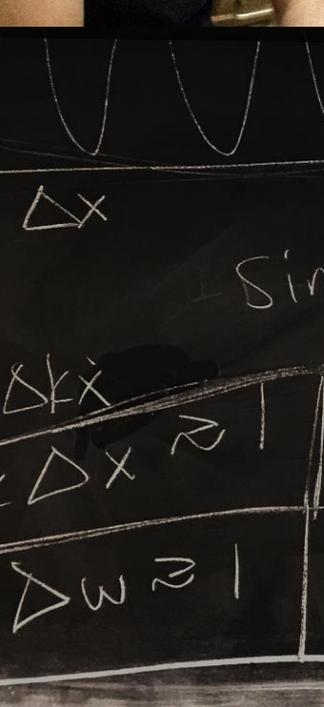
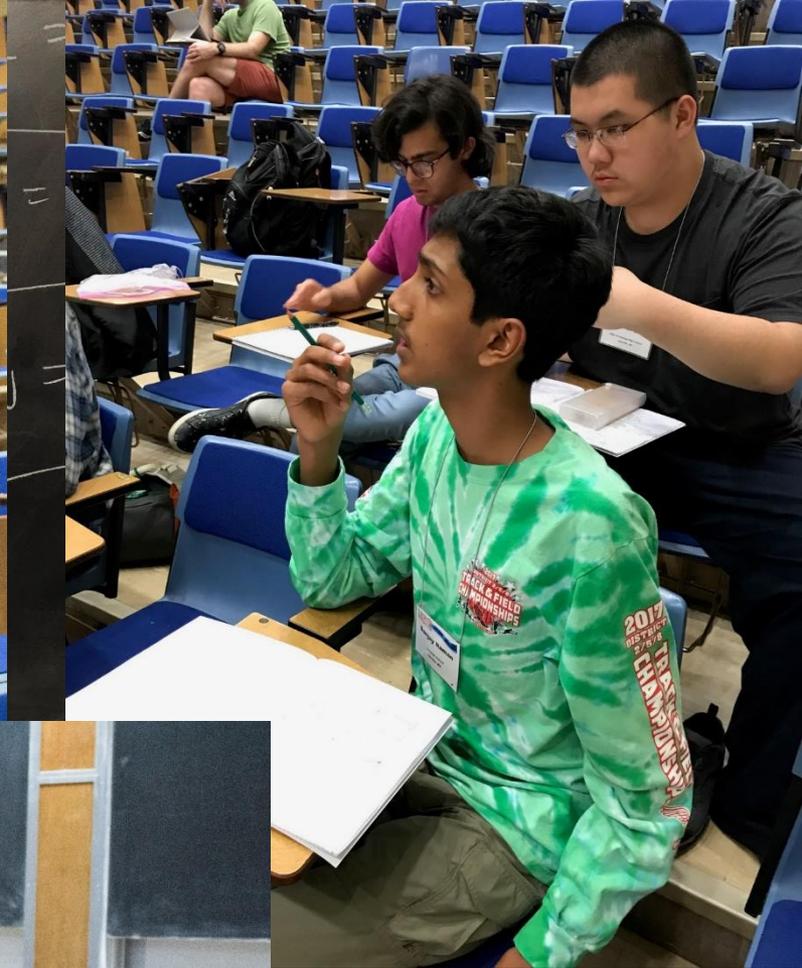
Handwritten physics notes on a whiteboard:

- Coordinate systems:  $ct'$ ,  $ct$ ,  $x'$ ,  $x$
- Velocity:  $v = \beta c$
- Energy:  $E = mc^2$
- Momentum:  $p = \gamma mv$
- Relativity:  $\gamma = \frac{1}{\sqrt{1 - \beta^2}}$
- Time dilation:  $\Delta t' = \gamma \Delta t$
- Length contraction:  $L' = \frac{L}{\gamma}$
- Velocity addition:  $v' = \frac{v + u}{1 + \frac{vu}{c^2}}$
- Other notes: "Nuclear Weapons!", "Lo-lan Fish!", "chess!", "KSpace Team"



$$k = \frac{n\pi}{L}$$
$$k = \frac{n\pi}{L}$$
$$k = (2n-1)\frac{\pi}{2L}$$





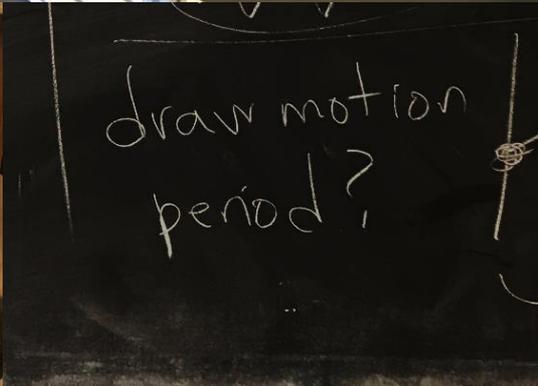
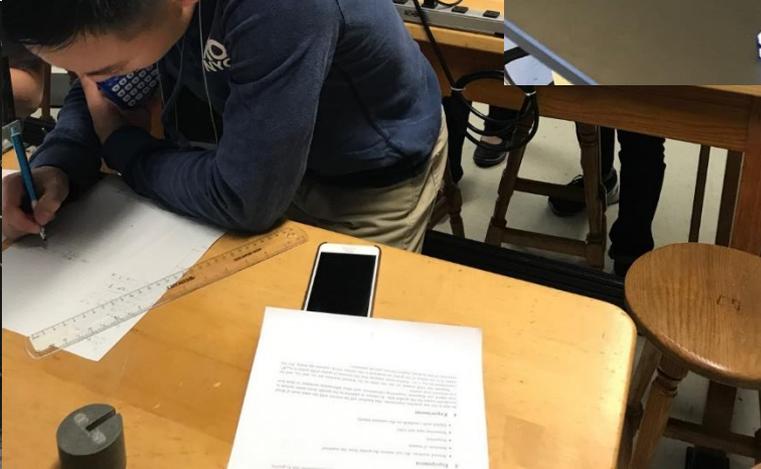
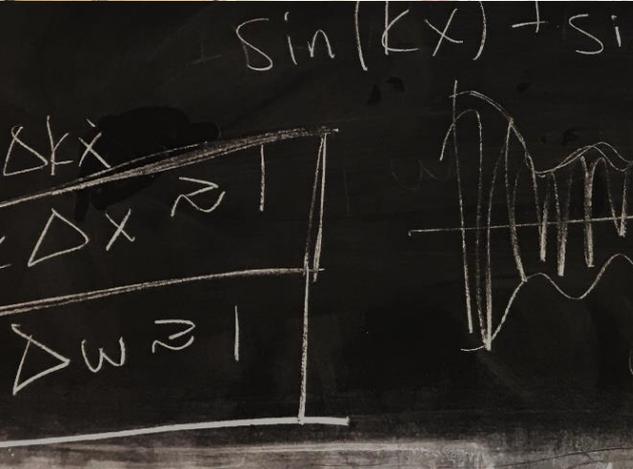
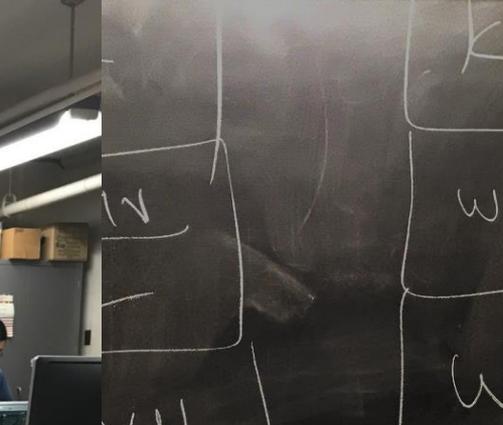
$k = \frac{n\pi}{L}$

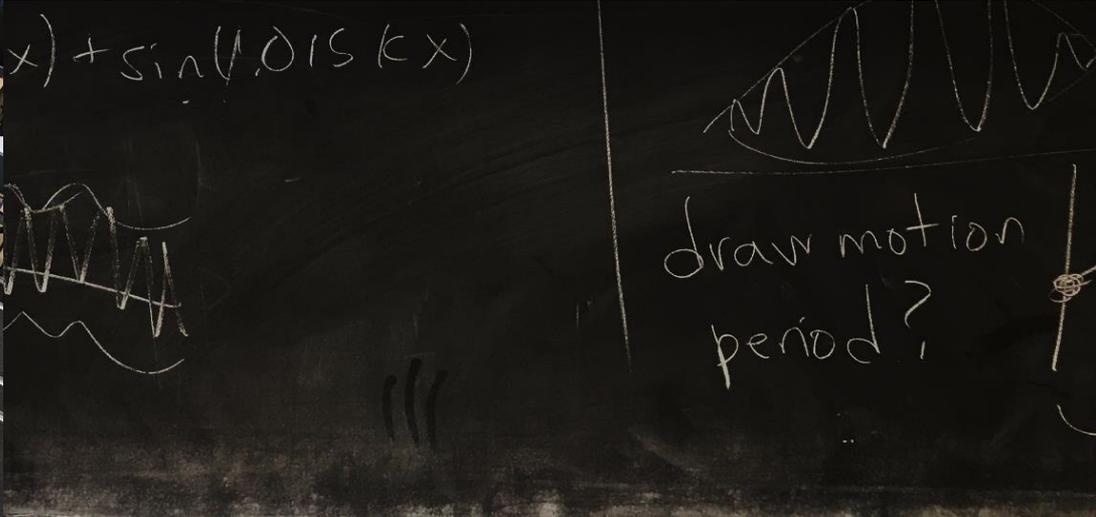
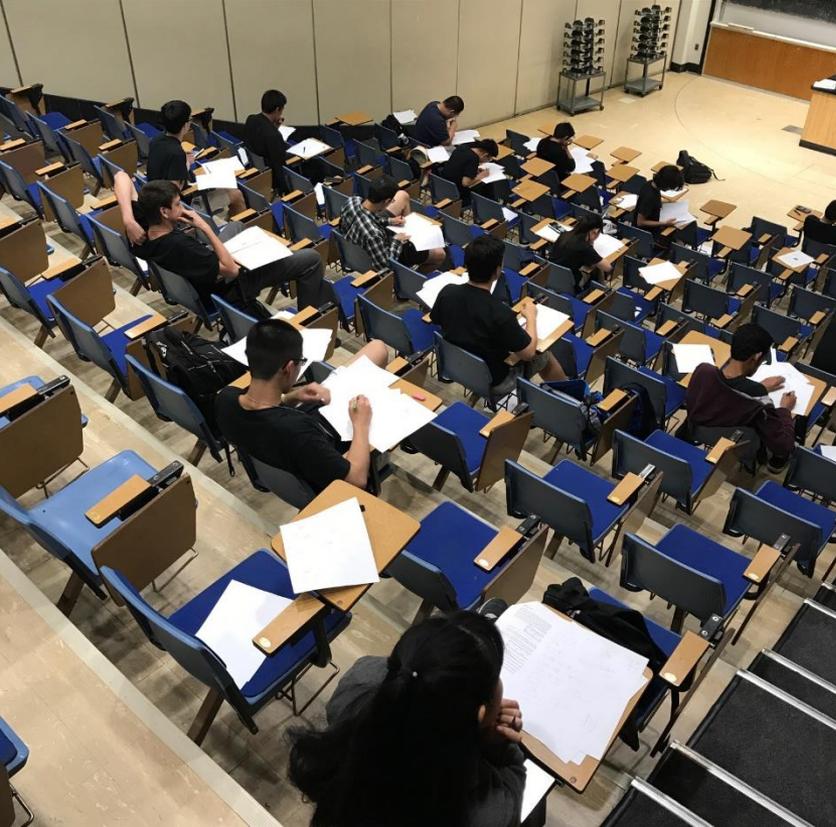
$\omega = \frac{n\pi v}{L}$

$\sin(\omega t)$

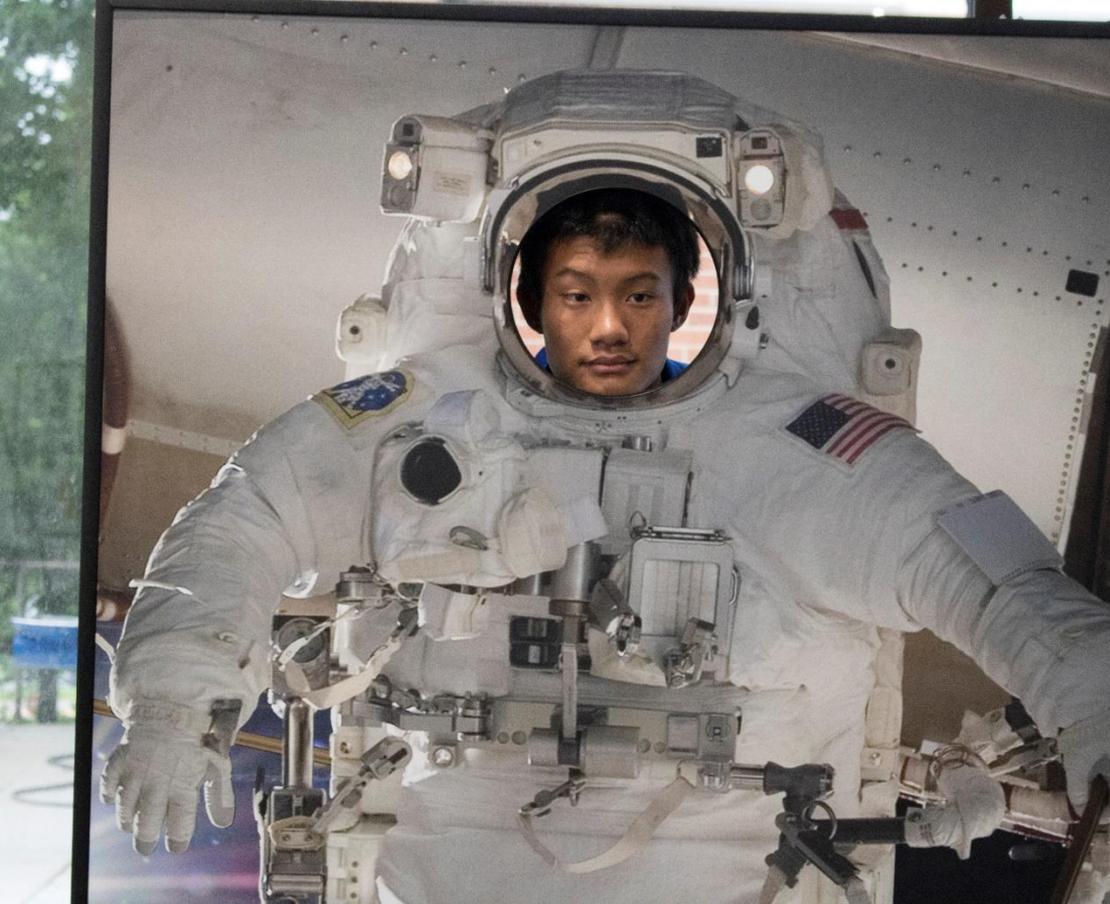
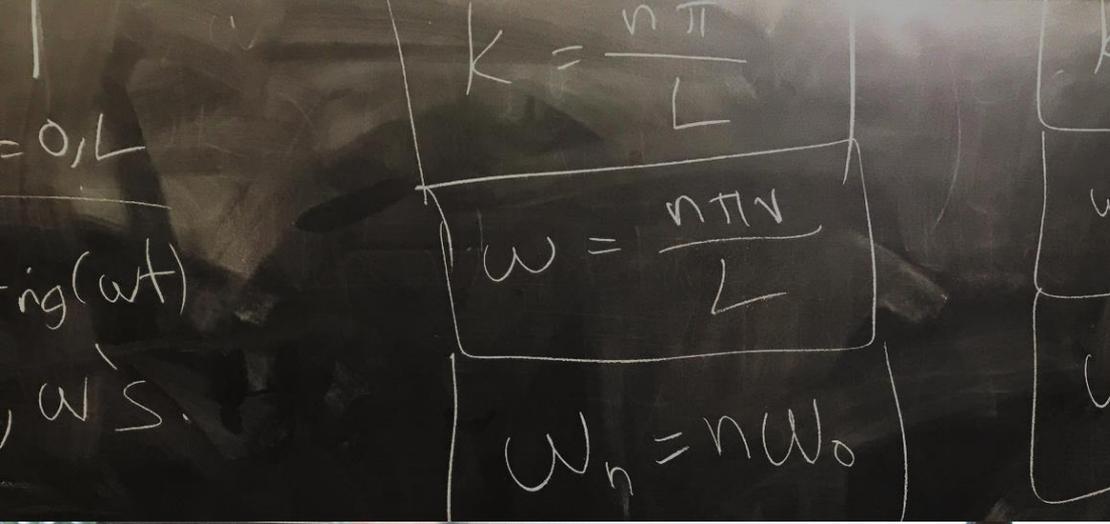














$k = \frac{n\pi}{L}$   
 $\omega = \frac{n\pi v}{L}$   
 $k = \frac{(2n-1)\pi}{2L}$   
 $\omega = vk$   
 $\omega = \frac{(2n-1)\pi v}{2L}$   
 $\omega^2 = \frac{(2n-1)^2 \pi^2 v^2}{4L^2}$



$\Delta x$   
 $\sin(kx)$   
 $\Delta k \approx \frac{1}{\Delta x}$   
 $\Delta \omega \approx \frac{1}{\Delta x}$

$\sin(k, x) + \sin$   
  
wave motion  
period?