



# Swing Set Sinusoids

and variations



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diy    
big kids  
see saw



## HS Math on the Playground

- See Saw variation—for Algebra 2 mass vs. distance
- Swing Problem—for Precalculus trigonometric models



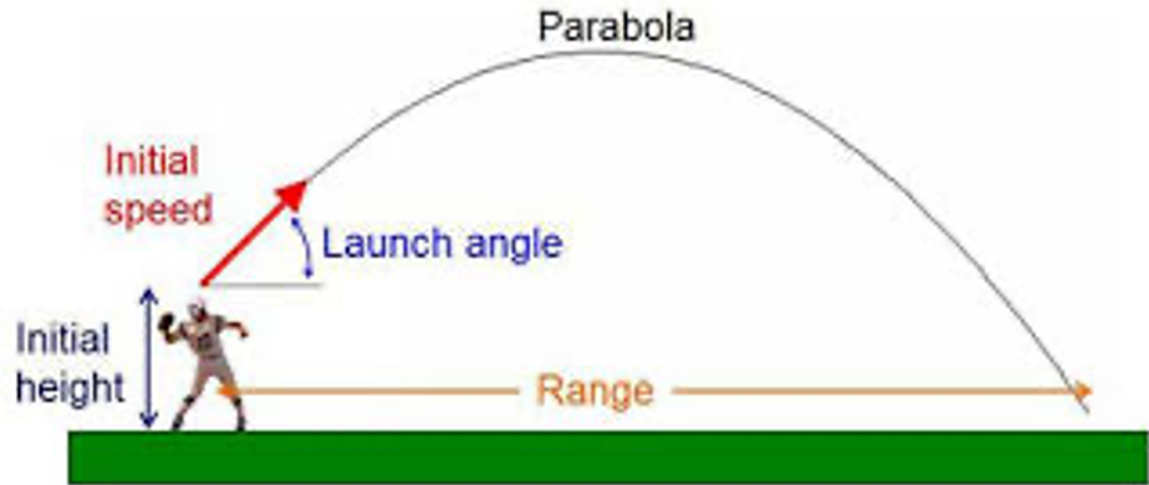
# Math on a See Saw

## Introduction by the [younger generation](#)

- Watch the video and think about the variables are involved in what you see changing
- How are the variables related?
- Ideas for classroom simulation with data collection?

# In situations involving motion ...

- Take time to think about what is varying
- How many quantities vary here?



# Time to Swing



# Swing Problem

- Watch the video and think about breaking up the swinger's position into her vertical and horizontal positions.
- We will use parametric equations and our knowledge of graphs of trigonometric functions to model her position over time
- Video by Marian Hernandez from NCSSM

## Video time



## Questions to consider:

- What types of functions should we use to model her motion?
  - Quadratic?
  - Sinusoidal?
- How are the periods of her horizontal motion and vertical motion related?
- What assumptions are we making with our model?
- What would happen if we “start” our time values when she is in the “middle” of her swing?



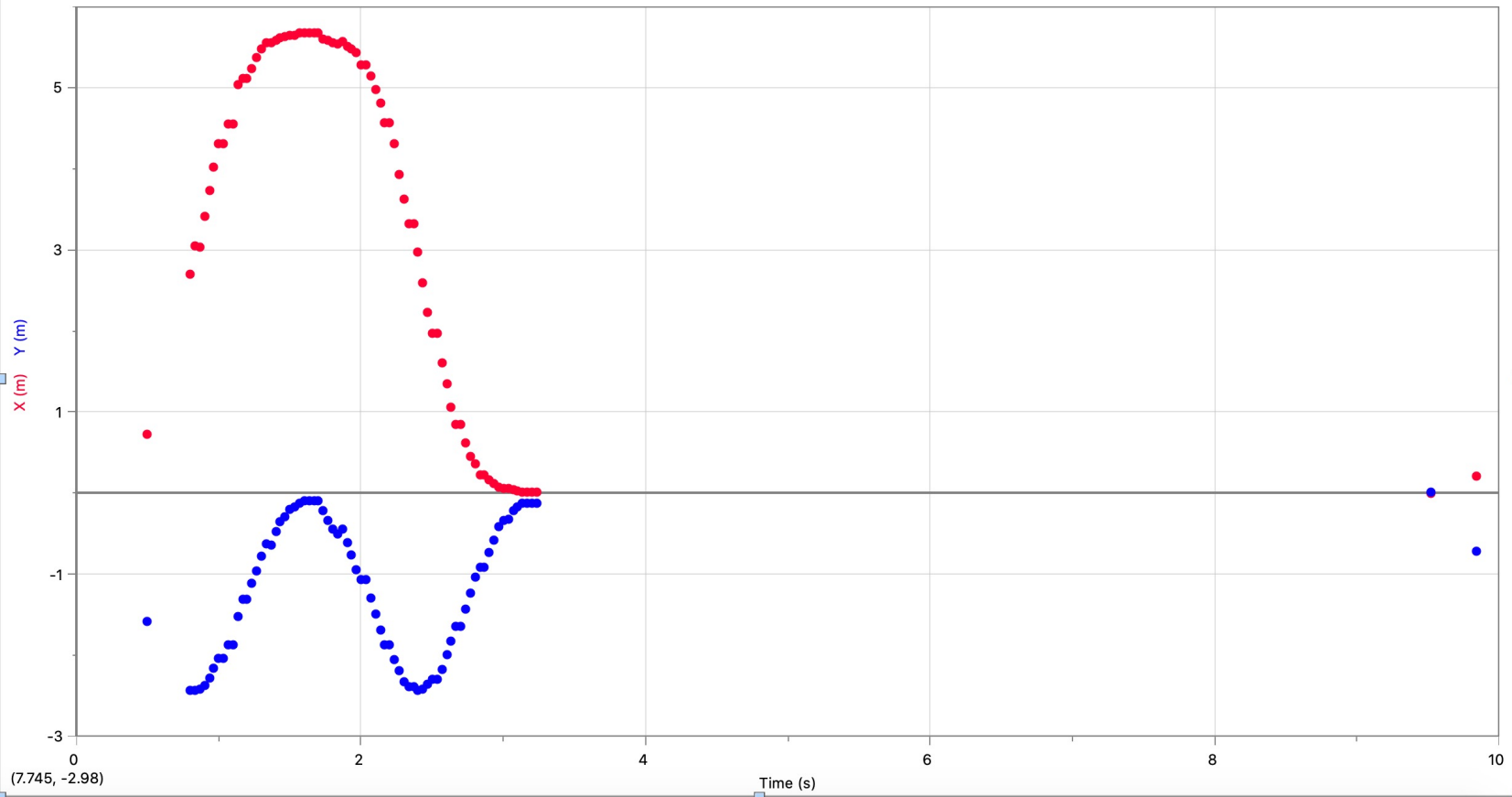
# Using Logger Pro

- Free trial for 1 month, maybe free download?
- Switch to Logger Pro. <https://www.vernier.com/product/logger-pro-3/>
  - Insert movie
  - Set origin
  - Set scale
  - Collect data

Collecting data

No Device Connected

VideoAnalysis		
	Y (m)	Vx (m/s)
1	-1.581	6.662
2	-2.434	6.692
3	-2.431	5.867
4	-2.413	6.505
5	-2.365	9.005
6	-2.287	8.800
7	-2.163	7.761
8	-2.041	5.087
9	-2.034	4.196
10	-1.872	4.504
11	-1.872	6.308
12	-1.523	6.438
13	-1.317	3.040
14	-1.317	2.560
15	-1.116	3.304
16	-0.9591	3.267
17	-0.7797	2.475
18	-0.6211	1.315
19	-0.6426	0.772
20	-0.4807	0.800
21	-0.3487	0.661
22	-0.2862	0.552
23	-0.2017	0.377
24	-0.1786	0.347
25	-0.1243	0.335
26	-0.0924	0.153
27	-0.0978	-0.018
28	-0.0978	-0.259
29	-0.0978	-0.899
30	-0.2125	-1.158
31	-0.3453	-0.811
32	-0.4473	-0.498
33	-0.5030	-0.136
34	-0.4485	-0.515



# Desmos images

- [Graphs](#)

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0.867533333	3.034253812
0.9009	3.41223165
0.934266667	3.731939153
0.967633333	4.023890314
66 more rows	
<a href="#">Show all</a>	
3.2032	0.014447686
3.236566667	0.014447686
9.518016667	-0.002248084
9.843166667	0.202687243

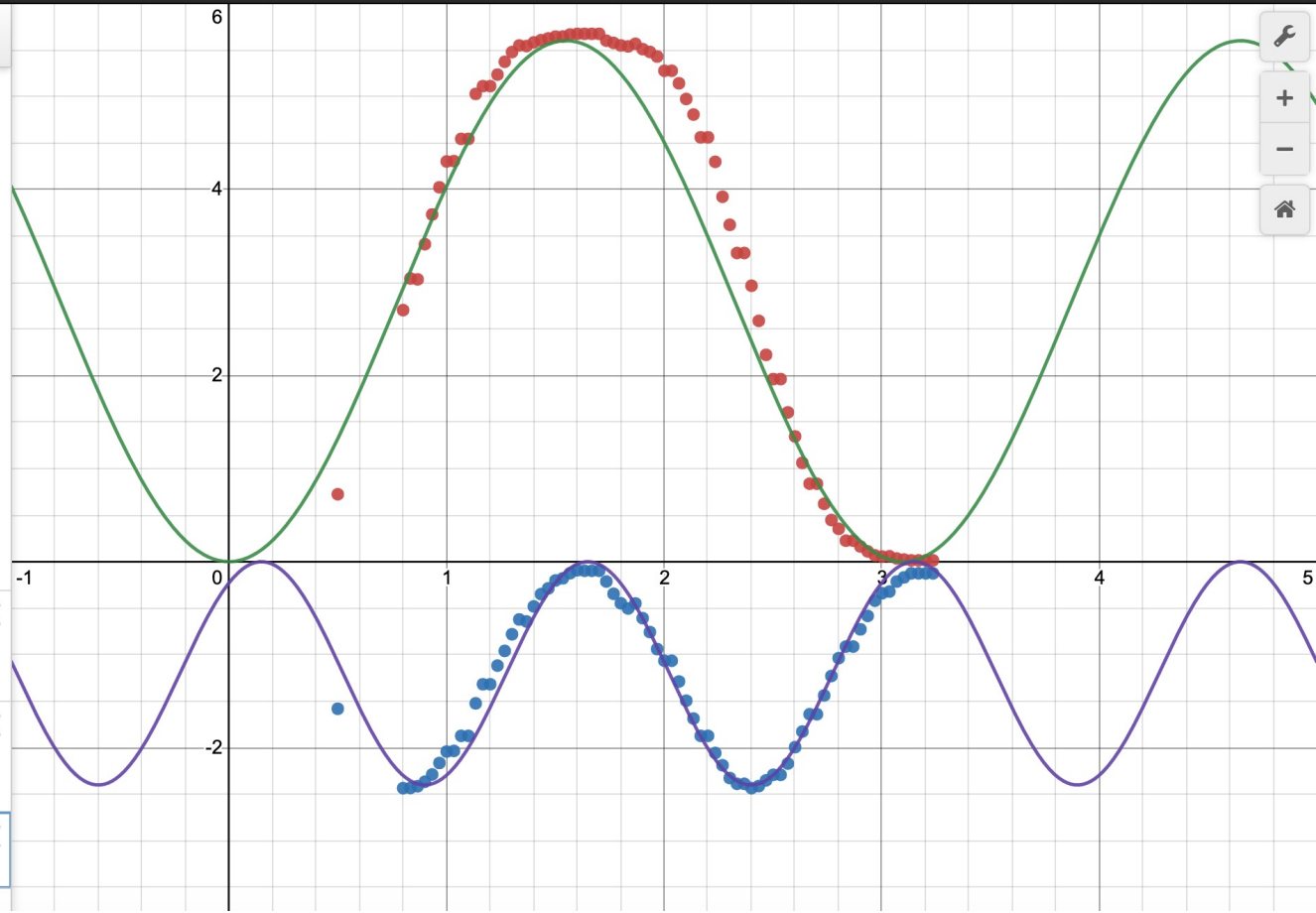
3 ⊗

$$y = 2.8 - 2.8 \cos\left(\frac{2\pi}{3.1} x\right)$$

4 ⊗

$$y = -1.2 - 1.2 \cos\left(\frac{2\pi}{1.5} (x - .9)\right)$$

5 ⊗



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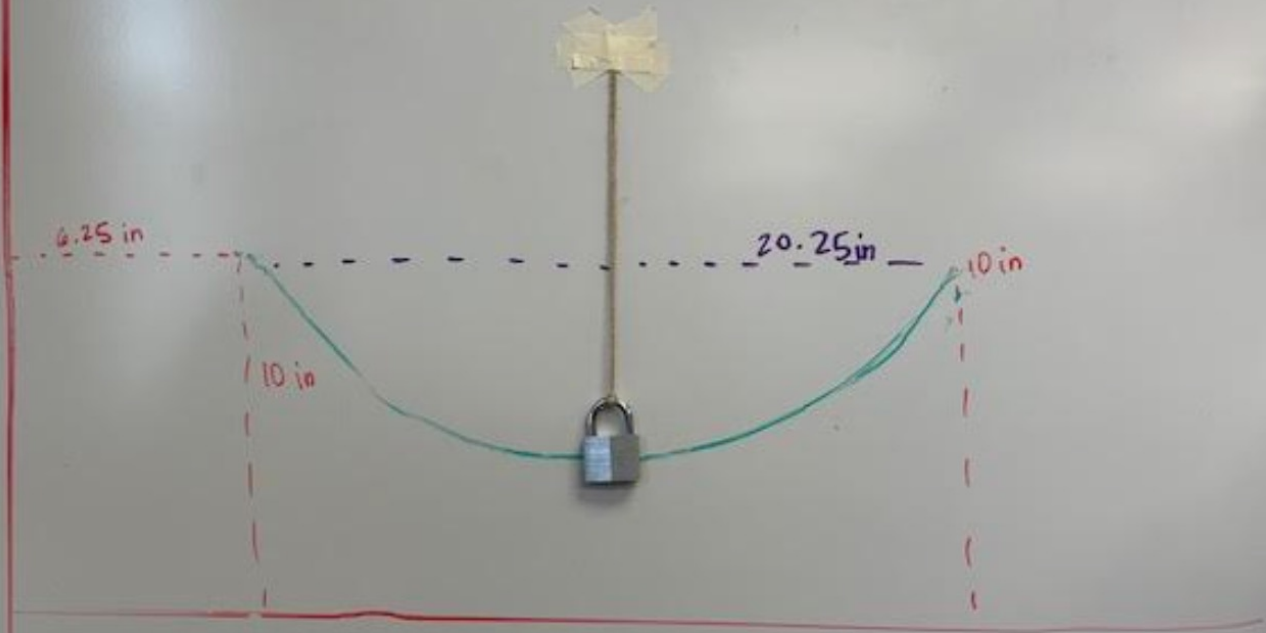
# Let's experiment

- Get a handout
- Get tools—heavy lock or washer, string, meter (or yard) stick
- Time-keeping device (watch, phone, stopwatch)
- Design experiment

Student handout:

<https://drive.google.com/file/d/1UtgRiMOUr08Oittt6wnGzl0o2ovLzrk6/view?usp=sharing>

# Student set up







# Student set up

