In Computer Lab

Unit 4: Exponents and Exponential Functions

Day 9 - Exponential Functions and Regression

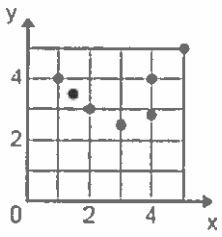
Today we will...

- use technology to determine a model that best fits given data

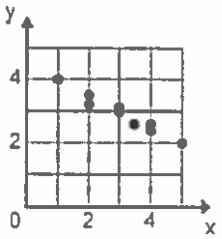
Choosing a Function to Model a Set of Data

1. What type of function do you believe would best model the data below?

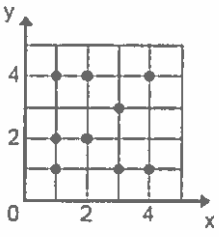
a)



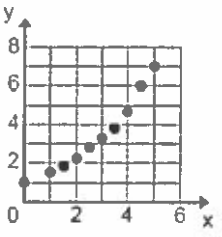
b)



c)



d)



Determining an Equation Using Regression

Given the following points, determine the equation of the function:

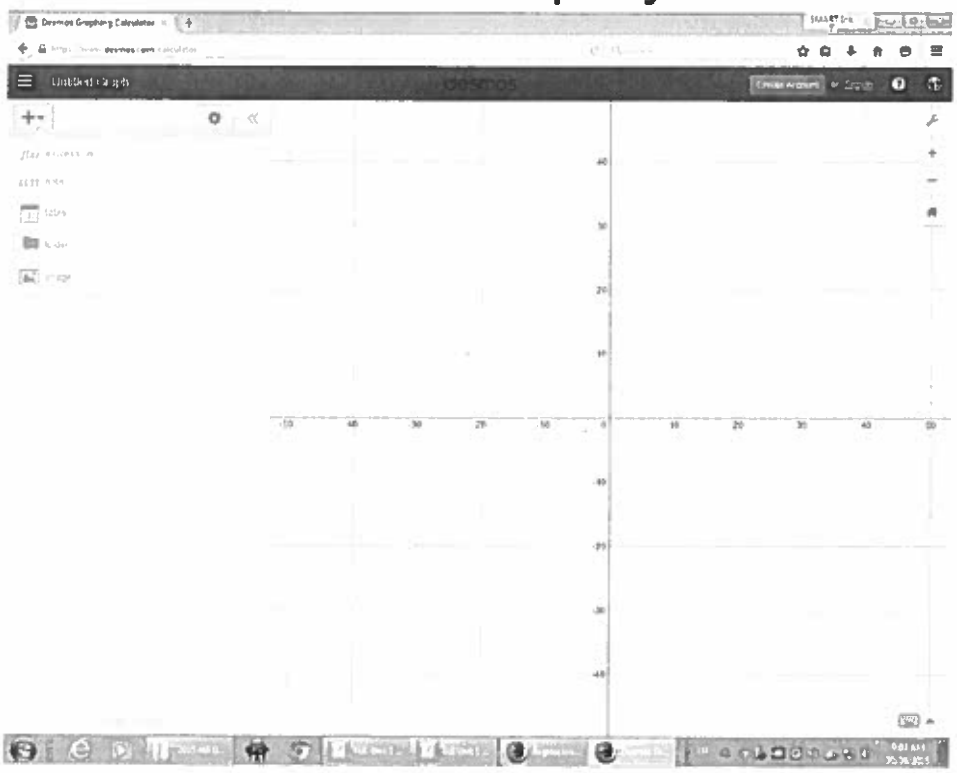
x	y
0	10
2	5.6
4	3.2
6	1.8
8	1
10	0.6
12	0.3

**Need to use REGRESSION

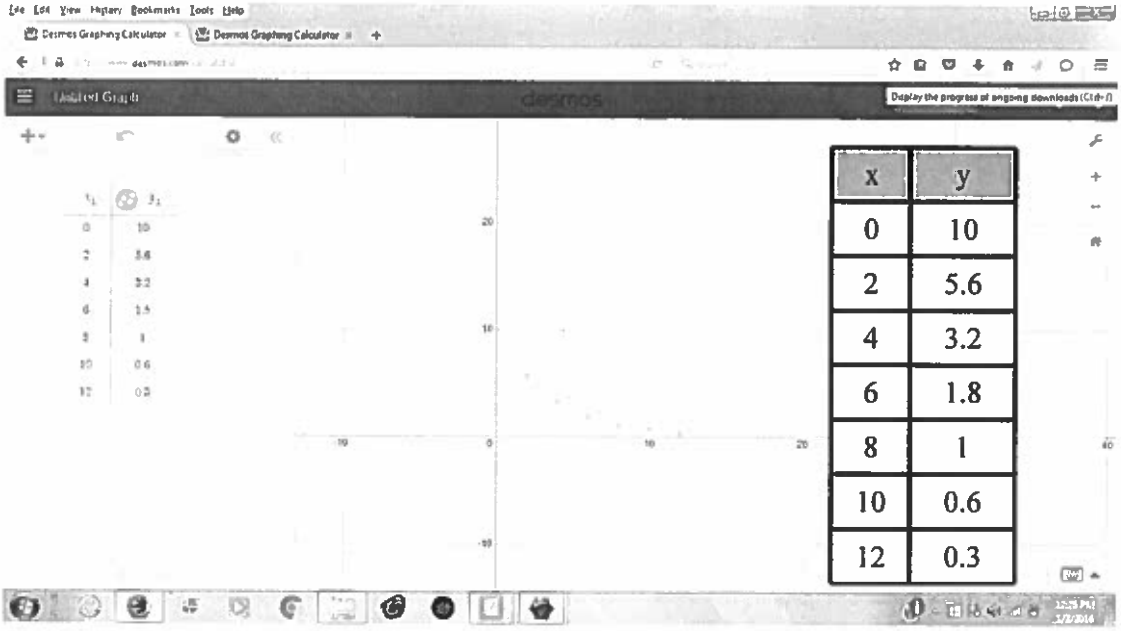
There are software programs to do this for us...

And DESMOS works pretty nicely...

Steps: 1. Add a table to input your data:



2. Enter the data in the table:



x	y
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3. Add a new equation that is the 'general form' for the type of function we think this would be:

ie. Linear $y_1 \sim mx_1 + b$

Quadratic $y_1 \sim a(x_1 - h)^2 + k$

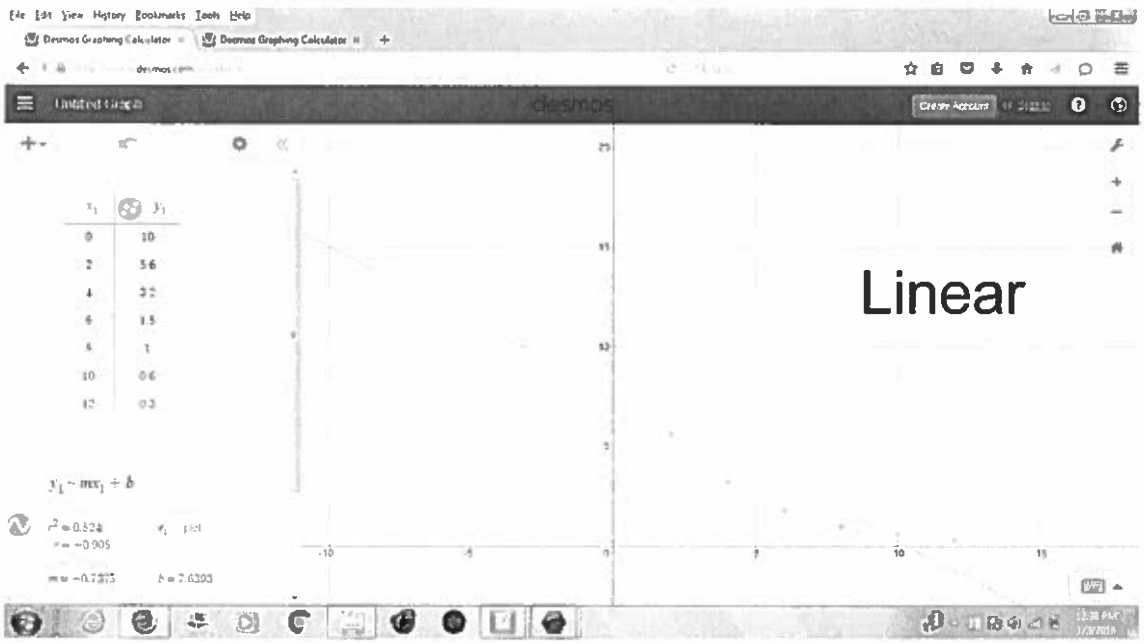
Exponential $y_1 \sim ab^{k(x_1 - h)} + c$

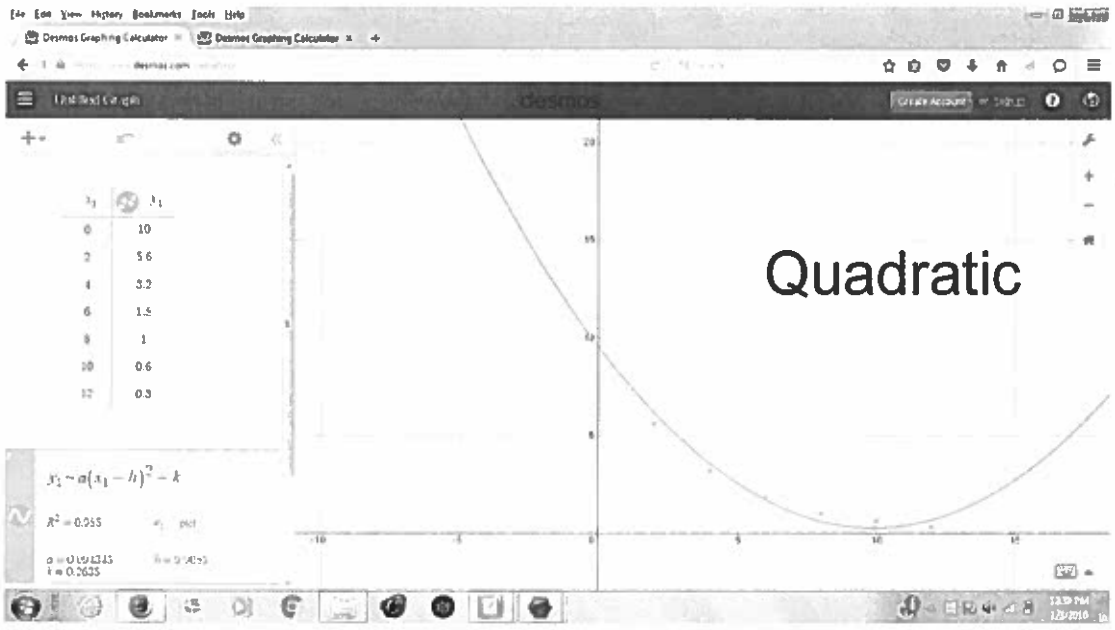
except use:

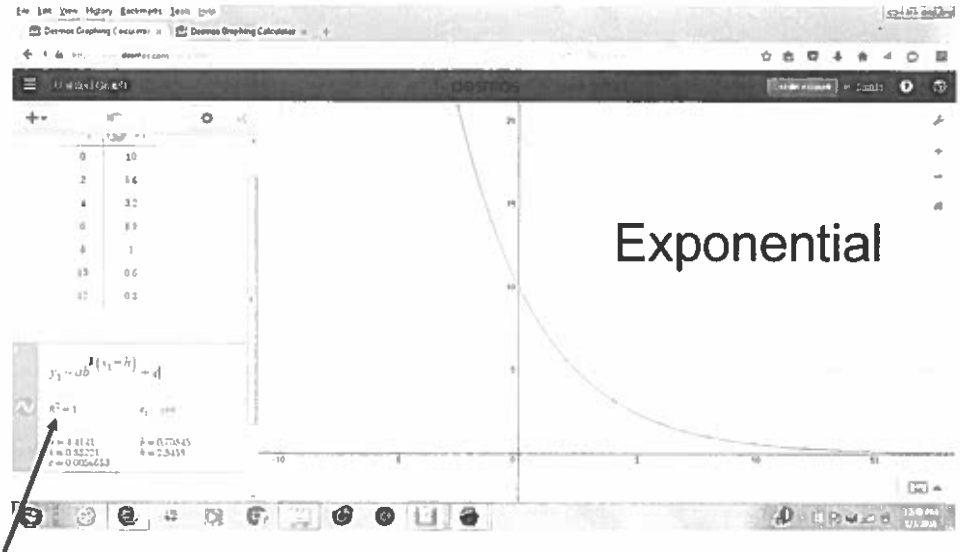
y_1 in place of the y (so that Desmos knows to use the data we entered in y_1 in our table)

x_1 in place of the x (so that Desmos knows to use the data we entered in x_1 in our table)

~ instead of the equal sign (so Desmos knows the model doesn't have to be a perfect fit)


Linear


Quadratic



Note:

How well the function models the data can actually be quantified using ...

R^2, the Coefficient of Determination (or Correlation Coefficient) - which is a measure of how well the regression line/ curve represents the data

0 = function does not model the data at all

0.5 = function is a poor model of the data

(50% of the time the model will make a correct prediction)

1 = function is a perfect model of the data

(100% of the time the model will make a correct prediction)

So.... the closer your R^2 value is to 1, the better the function models the data!

Looking at all three functions, the third (exponential) models the data the best with an R^2 value of 1.

Using the information given, VOILA.... You have your equation!!!

$$y=4.41(0.71)^{0.83(x - 2.85)} + 0.0057$$

Now, use your equation to determine the height of the ball after 2.25 seconds.

Today's Practice Questions:

Duotang - Day 5 # 1 - 3

Day 6 # 1 - 3 (whatever you can get to in class)