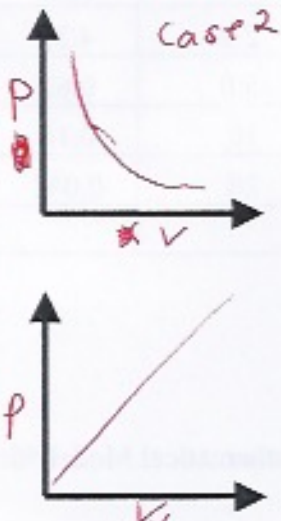
Mathematical Modeling - WS#1
Date: _____

Physics
Name: Ms Barge Pd. ____

For each data set below, determine the mathematical expression. To do this, first graph the original data. Assume the 1st column in each set of values to be the **independent** variable and the 2nd column the **dependent** variable. Then taking clues from the shape of the first graph, modify the data so that the modified data will plot as a straight line. Using the slope and y-intercept from the linear fit, write an appropriate mathematical expression for the relationship between the variables. Be sure to include units!

Data Set 1:

V (m^3)	P (pa)
.1	40
.5	8
1	4
2	2
4	1
5	.8
8	.5
10	.4



$y = 4x + 0$

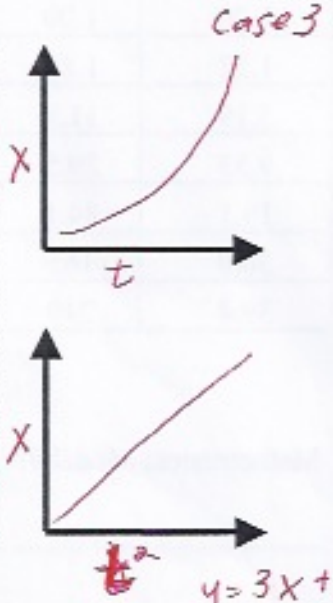
Mathematical Model #1:

$P = \left(4\ pa\ m^3\right)\frac{1}{V} + 0\ pa$

$P = \left(4\ pa\ m^3\right)\frac{1}{V}$

Data Set 2:

t (s)	x (m)
.1	.03
.2	.12
.5	.75
1	3
2	12
3	27
4	48
5	75



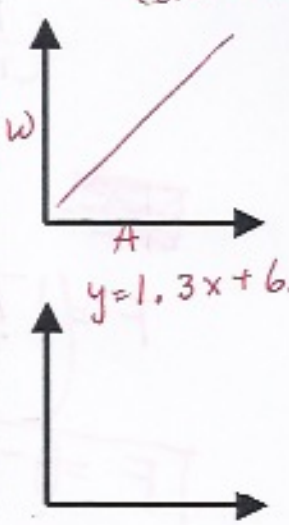
$y = 3x + 0$

Mathematical Model #2:

$t^2 = \left(3\ m/s^2\right)t^2 + 0\ m$

Data Set 3:

A (months)	W (lbs)
1	7.3
2	9.4
3	10.5
4	12.0
5	13.0
6	14.3
7	15.2
8	16.7



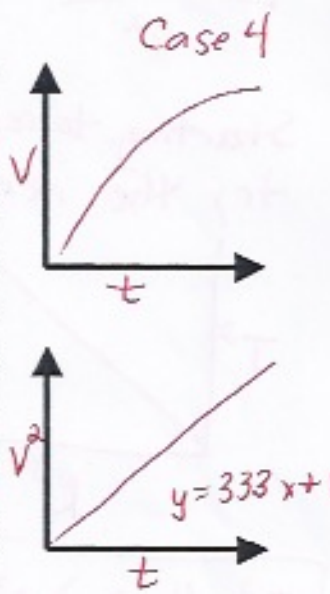
$y = 1.3x + 6.6$

Mathematical Model #3:

$W = \left(1.3\ \frac{lbs}{month}\right)A + 6.6\ lbs$

Data Set 4:

t (s)	v (m/s)
.3	10
1.2	20
2.7	30
4.8	40
7.5	50
10.8	60
14.7	70
19.2	80



$y = 333x + 1\times10^{-12}$

Mathematical Model #4:

$V^2 = \left(333\ \frac{m^2}{s^2}\right)t + 1\times10^{-12}\ m^2/s^2$

$\left(\frac{m^2}{s^2}\right)\frac{1}{s} = \frac{m^2}{s^3}$

$V^2 = \left(333\ \frac{m^2}{s^3}\right)t + 1\times10^{-12}\ \frac{m^2}{s^2}$

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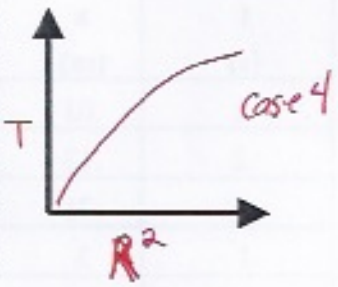
Data Set 5:

R (a.u.)	T (yr)
.38	.24
.72	.62
1.00	1.00
1.52	1.88
5.19	11.9
9.53	29.5
19.1	84.1
30.0	165
39.4	249



Data Set 6:

r (m)	F_{el} (N)
.2	425
.5	68.3
1.0	16.5
2.0	4.26
5.0	0.67
10.	0.18
20.	0.042

Mathematical Model #5:

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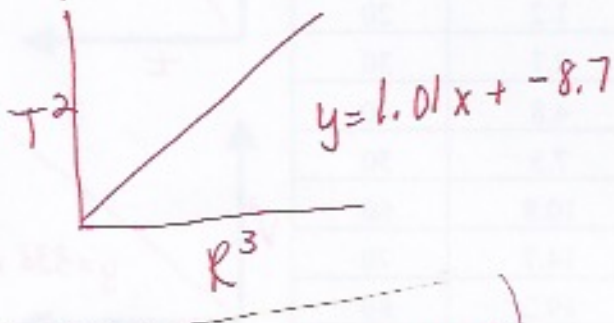
Starting to repeat, so try the next power (cubic-3)



$T^2 = \left(1 \frac{y^2}{au^3}\right) R^3 + -8.7y^2$

$T^2 = R^3$

Mathematical Model #6:

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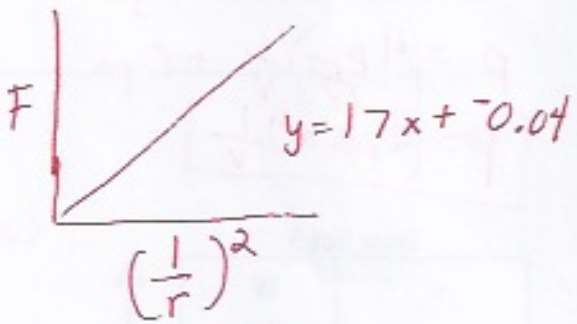

$F = \left(17 \frac{N}{\frac{1}{m^2}}\right)\left(\frac{1}{r}\right)^2 + -0.04N$

$F = (17 N m^2)\left(\frac{1}{r}\right)^2 + -0.04N$