

Lab 2: Newton's Second Law

Purpose: Study Newton's second law.

Background: To manipulate force and mass using a radar machine and computer, and measure acceleration using the equation.

Materials: cart, 506g weight, ramps, sail, radar, computer, logger pro.

Procedure:

1. Setup cart and radar machine
2. Measure the position, velocity, and acceleration with the fan on low and high settings.
3. Measure with the weight on the cart on low and high.
4. Measure the cart with the ramp on high and low angles.

Observations: We had to redo the measurements a few times because the cart would go off at a angle it was also hard to stop the cart. We also accidentally erased the data a few times. The radar also only records for ten seconds and will not record if it is too close. All in All though our graphs and tables were pretty accurate.

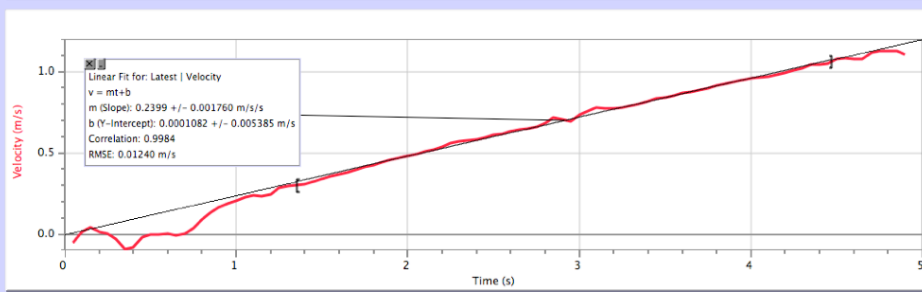
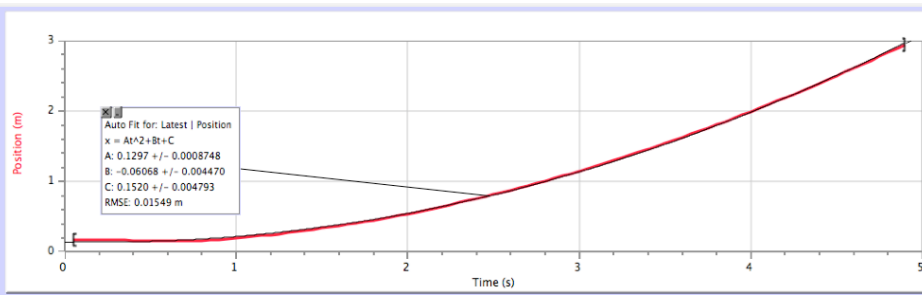
Analysis: We used Newton's second law: $F=MA$ to setup the lab. To find the acceleration we derived the coefficient from the quadratic curve fit of the graphs using the formula $S=1/2at^2$ and then double-checked our answer using with the linear equation $y=mx+b$ with 'm' being the acceleration.

Conclusion: Our data was pretty accurate. Some of the curve fits did not match as well as I would have liked them to match. The thing that affected our graphs the most was stopping the cart because the sail usually fell off. I believed that we proved Newton's law though.

Data: G1 no weight low, G2 no weight high, G3 weight low, G4 weight high, G5 low angle, G5 high angle.

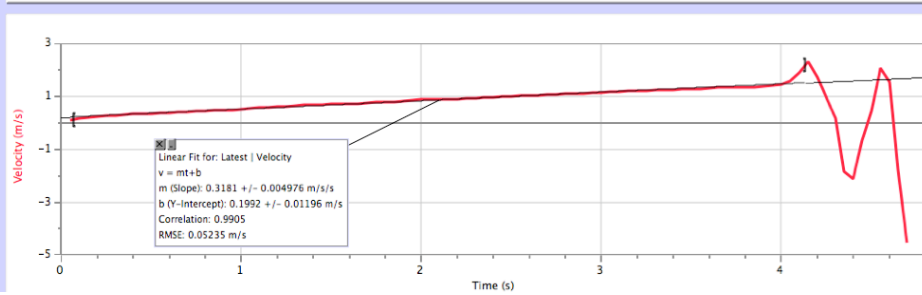
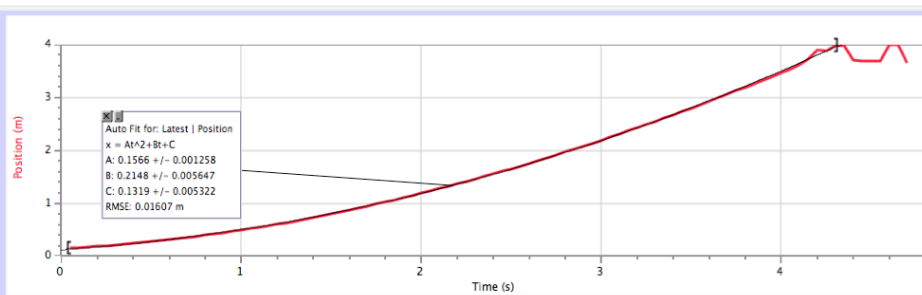
Latest			
	Time (s)	Position (m)	Velocity (m/s)
1	0.05	0.174	-0.050
2	0.10	0.168	0.017
3	0.15	0.176	0.044
4	0.20	0.176	0.012
5	0.25	0.175	0.004
6	0.30	0.177	-0.031
7	0.35	0.174	-0.094
8	0.40	0.164	-0.081
9	0.45	0.164	-0.019
10	0.50	0.165	-0.005
11	0.55	0.163	0.000
12	0.60	0.165	0.002
13	0.65	0.164	-0.006
14	0.70	0.163	0.001
15	0.75	0.163	0.035
16	0.80	0.166	0.086
17	0.85	0.172	0.133
18	0.90	0.180	0.165
19	0.95	0.189	0.189
20	1.00	0.199	0.208
21	1.05	0.209	0.229
22	1.10	0.223	0.237
23	1.15	0.234	0.231
24	1.20	0.244	0.247
25	1.25	0.258	0.282
26	1.30	0.274	0.297
27	1.35	0.288	0.299

Position m



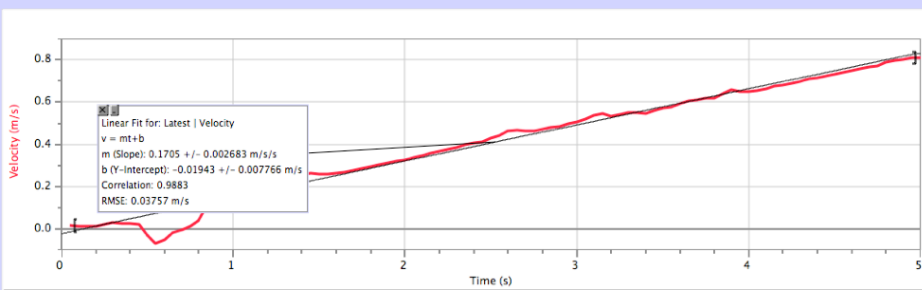
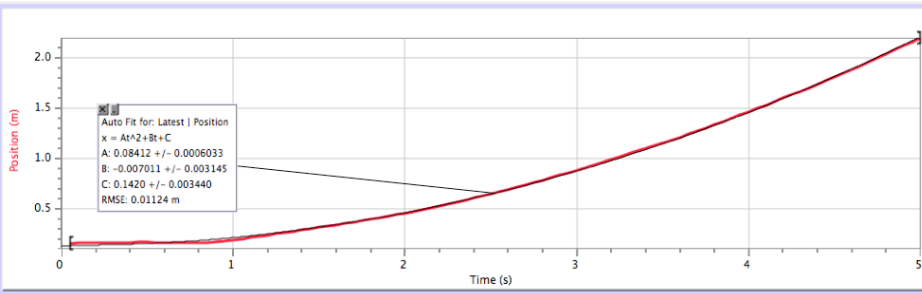
Latest			
	Time (s)	Position (m)	Velocity (m/s)
1	0.05	0.163	0.097
2	0.10	0.166	0.152
3	0.15	0.176	0.210
4	0.20	0.188	0.240
5	0.25	0.201	0.257
6	0.30	0.214	0.274
7	0.35	0.228	0.294
8	0.40	0.243	0.322
9	0.45	0.261	0.342
10	0.50	0.278	0.349
11	0.55	0.295	0.359
12	0.60	0.313	0.377
13	0.65	0.333	0.397
14	0.70	0.353	0.413
15	0.75	0.374	0.431
16	0.80	0.396	0.449
17	0.85	0.419	0.468
18	0.90	0.443	0.485
19	0.95	0.468	0.491
20	1.00	0.491	0.523
21	1.05	0.520	0.556
22	1.10	0.548	0.566
23	1.15	0.577	0.581
24	1.20	0.606	0.598
25	1.25	0.636	0.620
26	1.30	0.667	0.650
27	1.35	0.702	0.668

Position m



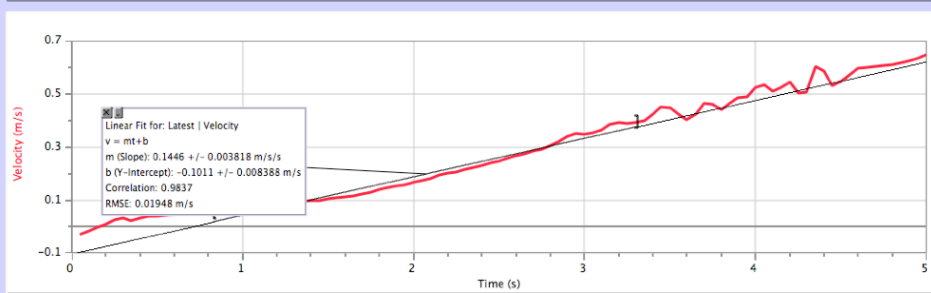
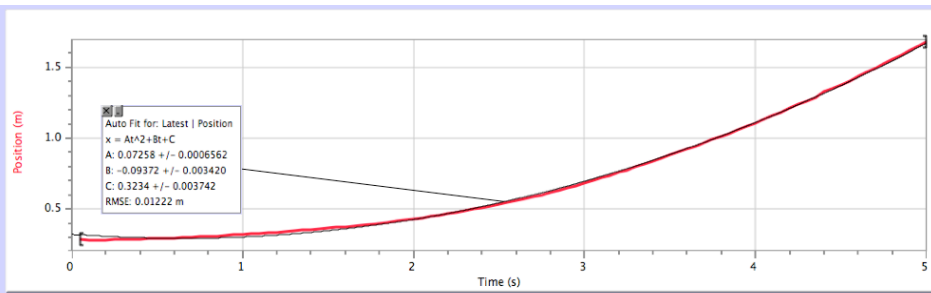
Latest			
	Time (s)	Position (m)	Velocity (m/s)
1	0.05	0.163	0.019
2	0.10	0.164	0.015
3	0.15	0.164	0.015
4	0.20	0.165	0.016
5	0.25	0.165	0.023
6	0.30	0.167	0.033
7	0.35	0.169	0.029
8	0.40	0.170	0.028
9	0.45	0.172	0.024
10	0.50	0.175	-0.028
11	0.55	0.169	-0.068
12	0.60	0.165	-0.049
13	0.65	0.163	-0.017
14	0.70	0.164	-0.004
15	0.75	0.163	0.012
16	0.80	0.165	0.042
17	0.85	0.165	0.115
18	0.90	0.177	0.178
19	0.95	0.185	0.193
20	1.00	0.196	0.211
21	1.05	0.206	0.220
22	1.10	0.218	0.231
23	1.15	0.230	0.240
24	1.20	0.242	0.251
25	1.25	0.255	0.246
26	1.30	0.266	0.249
27	1.35	0.280	0.252

Position m



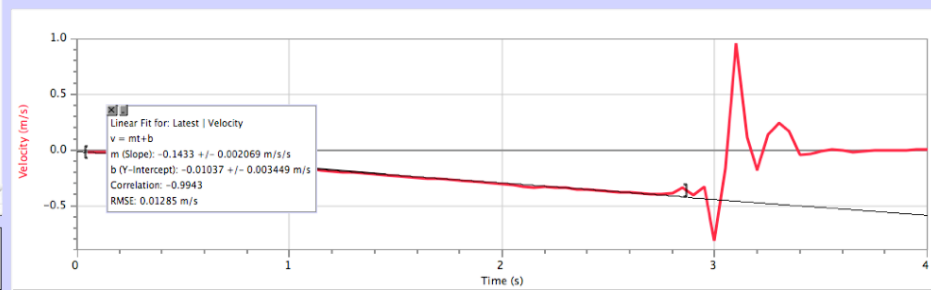
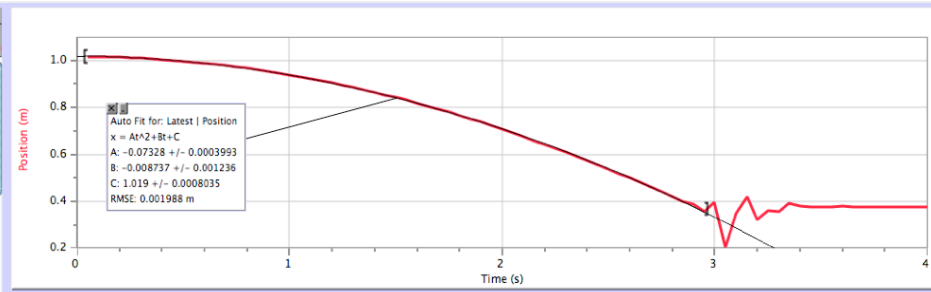
	Time (s)	Position (m)	Velocity (m/s)
1	0.05	0.285	-0.029
2	0.10	0.283	-0.014
3	0.15	0.283	-0.001
4	0.20	0.283	0.008
5	0.25	0.284	0.026
6	0.30	0.286	0.034
7	0.35	0.288	0.021
8	0.40	0.287	0.031
9	0.45	0.292	0.038
10	0.50	0.291	0.038
11	0.55	0.295	0.041
12	0.60	0.295	0.048
13	0.65	0.300	0.059
14	0.70	0.302	0.051
15	0.75	0.304	0.052
16	0.80	0.308	0.048
17	0.85	0.308	0.058
18	0.90	0.313	0.073
19	0.95	0.317	0.069
20	1.00	0.320	0.068
21	1.05	0.323	0.071
22	1.10	0.327	0.076
23	1.15	0.331	0.081
24	1.20	0.335	0.085
25	1.25	0.340	0.088
26	1.30	0.344	0.091
27	1.35	0.349	0.094

Position m



	Time (s)	Position (m)	Velocity (m/s)
1	0.05	1.015	-0.016
2	0.10	1.015	-0.018
3	0.15	1.014	-0.020
4	0.20	1.013	-0.026
5	0.25	1.011	-0.036
6	0.30	1.009	-0.047
7	0.35	1.006	-0.055
8	0.40	1.004	-0.062
9	0.45	1.000	-0.071
10	0.50	0.996	-0.079
11	0.55	0.993	-0.085
12	0.60	0.988	-0.094
13	0.65	0.983	-0.101
14	0.70	0.978	-0.110
15	0.75	0.972	-0.118
16	0.80	0.966	-0.124
17	0.85	0.960	-0.134
18	0.90	0.953	-0.142
19	0.95	0.946	-0.147
20	1.00	0.938	-0.155
21	1.05	0.930	-0.162
22	1.10	0.922	-0.170
23	1.15	0.913	-0.181
24	1.20	0.904	-0.190
25	1.25	0.894	-0.197
26	1.30	0.884	-0.202
27	1.35	0.874	-0.207

Position m



	Time (s)	Position (m)	Velocity (m/s)
1	0.05	1.073	0.099
2	0.10	1.084	-0.040
3	0.15	1.070	-0.127
4	0.20	1.067	-0.138
5	0.25	1.061	-0.234
6	0.30	1.044	-0.329
7	0.35	1.026	-0.390
8	0.40	1.005	-0.449
9	0.45	0.980	-0.487
10	0.50	0.954	-0.484
11	0.55	0.932	-0.486
12	0.60	0.909	-0.546
13	0.65	0.878	-0.619
14	0.70	0.844	-0.651
15	0.75	0.813	-0.677
16	0.80	0.777	-0.707
17	0.85	0.741	-0.730
18	0.90	0.704	-0.760
19	0.95	0.666	-0.796
20	1.00	0.625	-0.840
21	1.05	0.581	-0.856
22	1.10	0.537	-0.972
23	1.15	0.489	-1.198
24	1.20	0.484	-2.413
25	1.25	0.172	-2.258
26	1.30	0.181	-0.713
27	1.35	0.167	-0.187

Position m

