Three Sample Lab Reports Showing Progression from the Same Student

Grading Grid

	Satisfactory	Adequate	Poor
Addresses Content accurately and thoroughly			
Write to the appropriate Context or situation of assignment			
Addresses Audience appropriately			
Indicates clear Purpose for writing			
Organizes writing well			
Includes adequate Support (documentation and illustrations)			
Applies an appealing Design			
Uses clear Expression			

Comments:

Grade: ____________________

Beginning

STATEMENT OF PROBLEM, We were asked to determine if the acceleration of an objet going up an incline would be the same, greater, or less than the acceleration of that same object going down the incline. We were also asked to construct a graph of acceleration versus time. This graph was supposed to include the whole motion of the object, taking in consideration the acceleration of the object at its highest point. Our group took a metal cart, stopwatch, and a meter stick. We rolled the cart up the incline and then let it come down the same incline as to simulate the roller coaster track. We recorded this with lab view and made sure that the cart never left the picture of the movie so we could get accurate data.

PREDICTION, I believe that our whole group came to the conclusion that the cart would have a greater acceleration going down the track than it would going up that same track. We talked it over with ourselves and still had that same idea. Our group also compared our graphs (witch were all a little different) and thought that the acceleration would be greater going down than going up. Our group all agreed that the acceleration would be zero at its highest point. Our group decided that V-V0/T would be a good way to measure the acceleration and compare each side of the ramp. After some consideration and a little help from you we decided to use the equation Xo + VoT + ½(At squared. Then in the LabView, we chose the equation that represented this form A +Bt C (t) squared. We needed these equations to represent X as a position of time.

DATA AND RESULTS, We took our cart, gave it a push up the inclined track, and recorded its motion going up the track and coming back down on one continuos recording. We were careful to make sure that the cart did not go off the screen. While we recorded this on Lab View we measured the time that it took. As you can see from looking at our graph of the actual position Vs time we somehow did not have an accurate time and we understated our acceleration. My original prediction graph does not look like my actual graph that the lab view produced. I now realize that the graph of a object going up and down the same incline is a upside down parabola because the acceleration is always negative. Furthermore the acceleration of the object is always constant; witch is the reason the equation representing our cart is the form of a parabola.

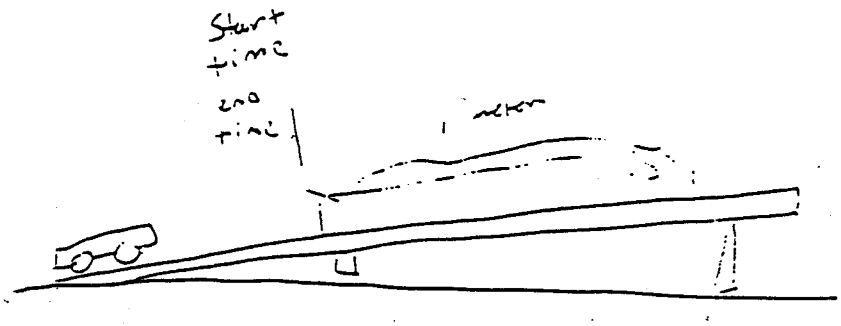
UNCERTAINTY, I would say that most of the uncertainty in this experiment would be from the error in the time as well as the exactness of the measurement of length. Also, there may be some uncertainty in the recording of the motion if a few frames are skipped or could not record all the information on the screen.

CONCLUSIONS, The conclusion that I came to, is that the cart has the same acceleration going either way up or down the track because they are both on the same angle. My personal prediction was that the acceleration would be greater going down the track. Maybe this would be so if the angle going down were steeper? In addition, my original equation to represent the graph I drew was wrong. The right equation is Xo + Vo + ½(a)(t)squared. The equation I had was A= V-Vo/t. In addition, we underestimated our acceleration as you can see in the graph from LabView witch is attached. The reason that this is wrong is that I thought the acceleration would be different. The reason why we underestimated our acceleration is because we had inaccurate time recorded. This is where the level of uncertainty comes into play. I also observed that the acceleration is zero at the time where it switches from going up the track to down the track. This is what we predicted to happen. Our group did not have time to make an acceleration Vs time graph. However, the graph is a constant slope from left to right because the acceleration is always negative and this is why the graph is an upside down parabola. This lab has helped me understand the idea of acceleration on an incline and decline. I also learned that the acceleration is always negative (in this respect) witch is a little hard to comprehend at first but it was nice to observe this in lab.

ALTERNATIVE ANALYSIS, one way to get the acceleration of the object from our graph of x as a position of time is to take the derivative of the equation as follows.

X1= Xo + Vot + (a/2) t squared witch is X= Vo + 2(a/2)t

This gives you the area under the graph or in these terms the acceleration. This comes out to be roughly 30 cm/s. This is a good alternative analysis because this corresponds with the graph.



equipment : metal cart, Ramp on an incline, meter stick, video camera, computer, stopwatch

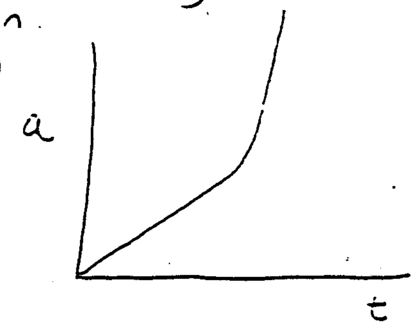
purpose: Determine if the acceleration is faster, slower or the same both ways on the [illegible]

method: One person pushes the cart while one records the motion on the computer. LAST The third person records the time

explanation. The acceleration is constant.

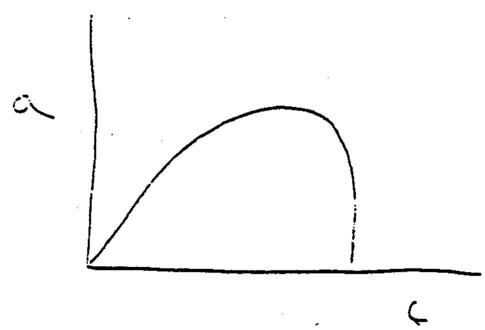
My Initial graph that I predicted before coming to class looks like the shown.

graph 1)



Then we talked it over with each other in class and came to the conclusion that the cart will accelerate faster going down -

graph 2)

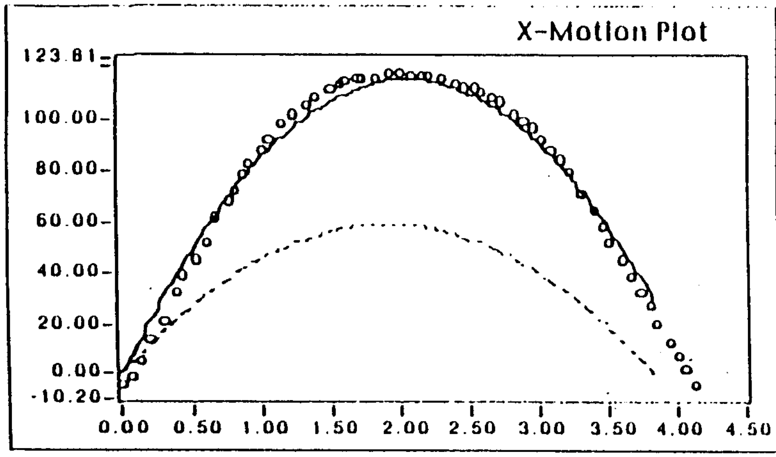


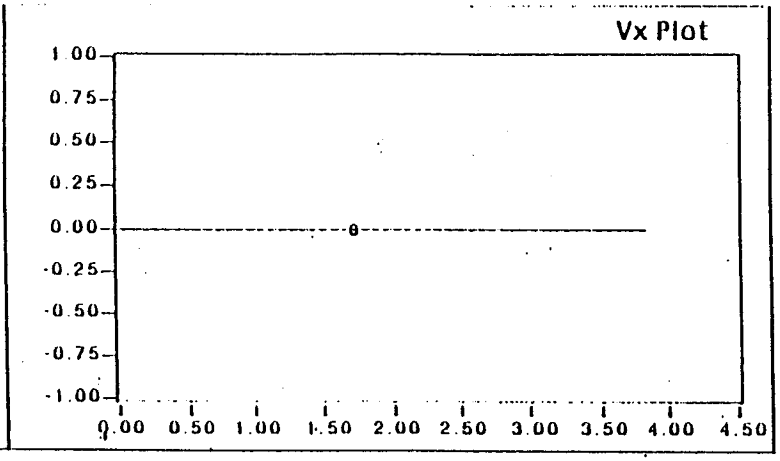
This graph is more like the true graph we were on the right track.

Then the next prediction for the graph made was on the computer. That graph is on the next page.

Movie Name: " Movie 2"
Data Taken: Wednesday, September 23, 1998, 6:18 PM

Your Graph Title Goes Here!





X Prediction

x(t) = 0.00 + 62.00t + −16.20t^2

X Fit

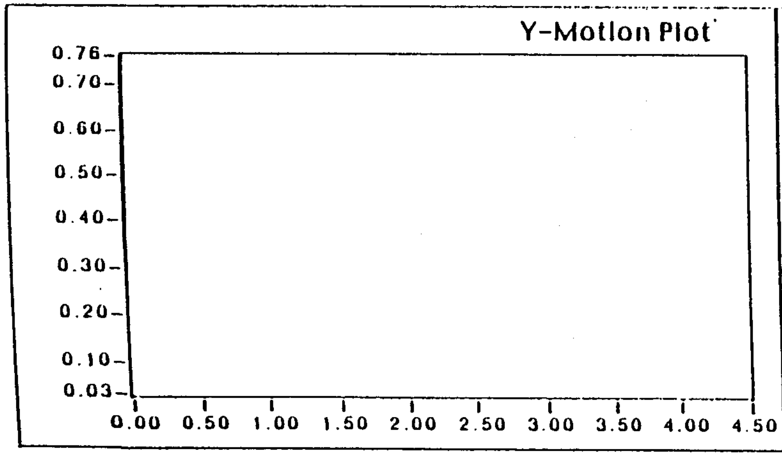
x(t) = 0.00 + 112.00t + −27.20t^2

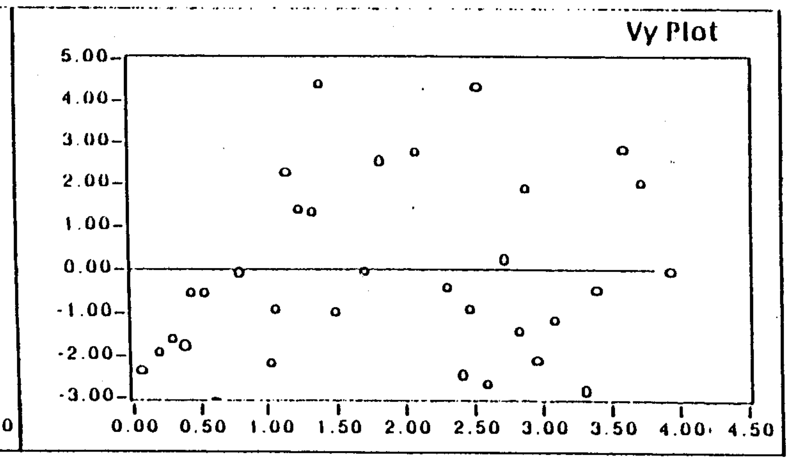
Vx Prediction

Vx(t) = 0.00 + 0.00t

Vx Fit

Vx(t) = 0.00 + 0.00t





Y Prediction

y(t) = 0.00 + 0.00t

Y Fit

y(t) = 0.00 + 0.00t

Vy Prediction

Vy(t) = 0.00 + 0.00t

Vy Fit

Vy(t) = 0.00 + 0.00t

Middle

Statement of Problem

We were asked to determine if the frictional force on an object is larger when the object speeds up or when the object is coasting. Our setup was a cart on a track, which was attached to a mass that was hanging over the side of the table by a string. We were given a cart that had a weight of 505 grams and we could change the weight of the hanging mass. We were asked to determine the acceleration of the cart and with that information we could figure out the frictional force excerpted on the cart. While we recorded this motion of the cart with Lab View we also timed the cart to see how long it took to come to a rest from when we drooped the mass which struck the floor.

PREDICTION

Our group Predicted that the frictional force of an object decreases with an increase in acceleration. This indicated to us that because the hanging block and cart are attached the acceleration would be greater if the mass of the hanging block increases. So, we predicted with an increase in the mass of the hanging block the friction will decrease. Our group also came to the prediction that the cart will have a negative acceleration after the hanging mass hits the floor. Because the cart is negatively accelerating the cart is slowing down very fast and the frictional force is greater after the hanging mass hits the floor. My personal prediction was the same except I thought that the acceleration would be zero after the hanging mass hits the floor.

DATA AND RESULTS

. Our group took a cart which was attached to a hanging mass by a string we dropped the mass and the cart began to accelerate positively until the mass hit the floor. Once the mass hit the floor the cart began to accelerate negatively which then the cart comes to a stop. The entire time of the motion is 2.5 seconds and the cart traveled about 167 centimeters. We recorded this motion of the cart with Lab View and then we analyzed our data. We used the equation A + BT + CT^2 to represent our data that would produce the graphs using the Lab View software. Our graph of the position Vs time graph is a positively sloping line starting from the origin and moving to the upper right part of the page. This graph resembles the first quadrant of a y=x^2 graph. This indicates that the acceleration of the cart is positive before the hanging mass hits the ground. The position Vs time graph for the cart after the hanging mass hits the ground resembles half of an upside down parabola, which indicates the acceleration, is negative after the hanging mass hits the ground. Both of these graphs are attached to this report so you can view them. Our group did not have enough time to finish the lab; therefore, we did not get an equation for the graph after the hanging mass hits the floor.

Instead of getting the acceleration from Lab View we had to figure it out on our own using the derivative of the position Vs time graph to get the velocity and the using the change in velocity to get the acceleration. I concluded that the acceleration was –1.0 m/s^2. Now that I have the acceleration I can figure out the frictional force on the cart before and after the hanging mass hits the floor. I used f = Mag – (Mg+ Ma)(a) to get the frictional force of the cart before the hanging mass hits the floor. I also used –f = Ma to get the frictional force after the hanging mass hits the floor, which is much simpler because there is no tension in the rope. The cart weighed 505 grams and the hanging mass was 100 grams and the acceleration was –1.0 m/s^2. With this information substituted into the equations above we get the frictional force of the cart is -.53 after the hanging mass hits the ground and 1.5 before it hits the ground.

UNCERTAINTY

There is always uncertainty in every experiment and in this experiment, I would have to say there is three main factors. One main uncertainty is the exactness of the measurement, we measured 167 cm and that could be of by + or – 1 cm. Also, there has to be uncertainty in the recording of the carts motion. If the recording is choppy than there will only be a few data points, which in return throws off our graph. Last, there is the measurement of time we estimated 2.5 seconds for the motion of the cart. This estimate is good up to + or - .1 seconds. All of these uncertainties defiantly make a difference in the outcome. Also, there is a special uncertainty for our group because we had to calculate the acceleration by the slope of the graph where we could have got the acceleration from the Lab View results.

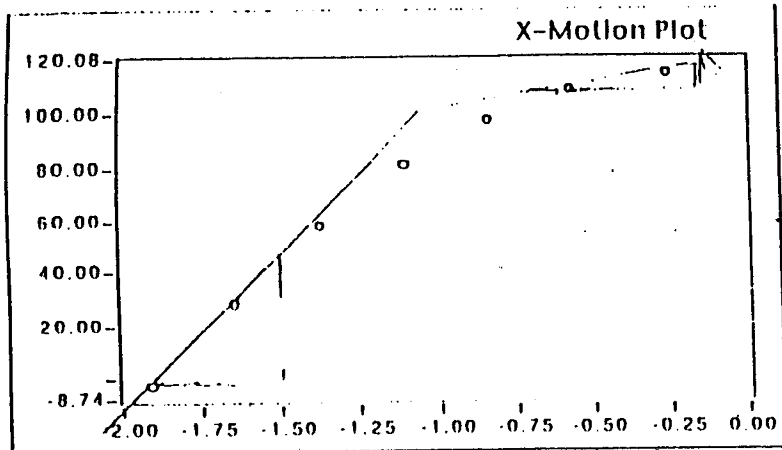
CONCLUSION

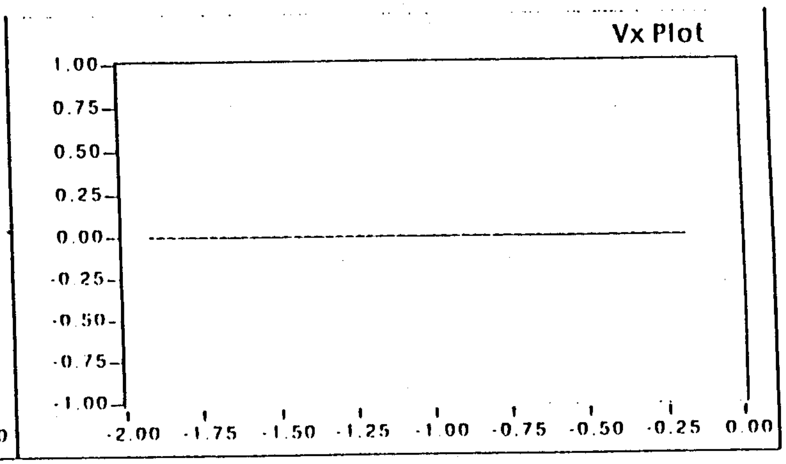
The conclusion that I have come to is that the frictional force of an object increases when the object is accelerating and that the frictional force is less for an object that is simply coasting. This conclusion is different than my personal prediction and our group prediction. Our group predicted exactly opposite of what is concluded here. This makes me wonder if my results are wrong or if this conclusion is valid. The only way I can see that this is true is because the more force in one direction than there has to be an opposing force in the opposite direction. Therefore, the more acceleration the more frictional force there is in the opposite direction. I am curious to know if this conclusion is correct.

$V = \frac{\Delta x}{\Delta t}$ $a = \frac{\Delta v}{\Delta t}$

MovieName:"lab3.3"
DataTaken:Wednesday, October 14, 1998, 5:38 PM

Your Graph Title Goes Here!





XPrediction

x(t) = 0.00 + 120.00t + -35.00t^2

XFit

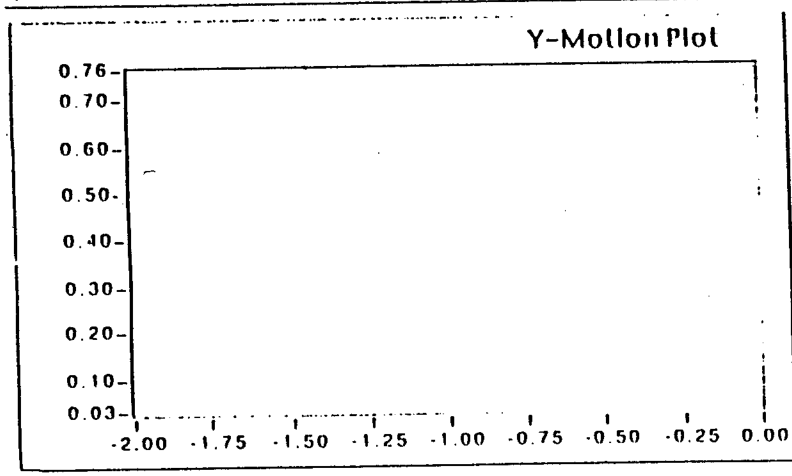
x(t) = 0.00 + 120.00t + -35.00t^2

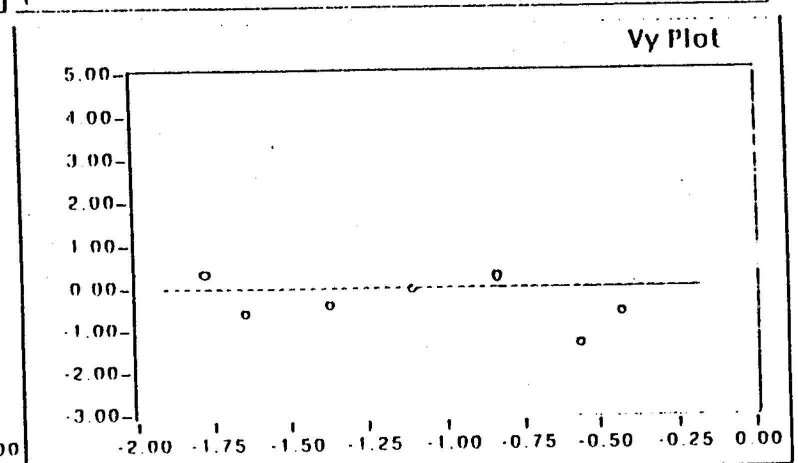
VxPrediction

Vx(t) = 0.00 + 0.00t

VxFit

Vx(t) = 0.00 + 0.00t





YPrediction

y(t) = 0.00 + 0.00t

YFit

y(t) = 0.00 + 0.00t

VyPrediction

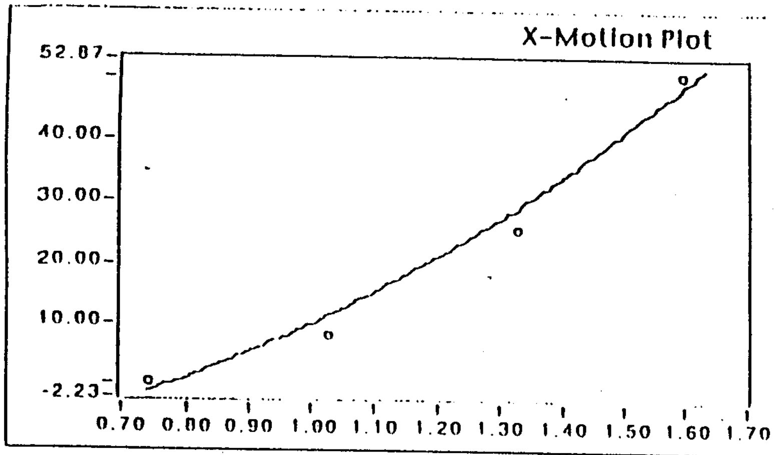
Vy(t) = 0.00 + 0.00t

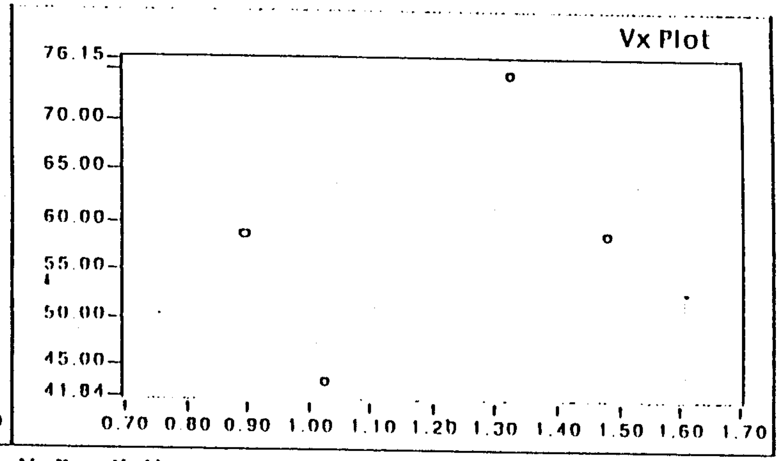
VyFit

Vy(t) = 0.00 + 0.00t

Movie Name: "lab 3.3"
Data Taken: Wednesday, October 14, 1998, 5:33 PM

Your Graph Title Goes Here!





XPrediction

x(t) = 0.00 + 0.00t + 490.00t^2

XFit

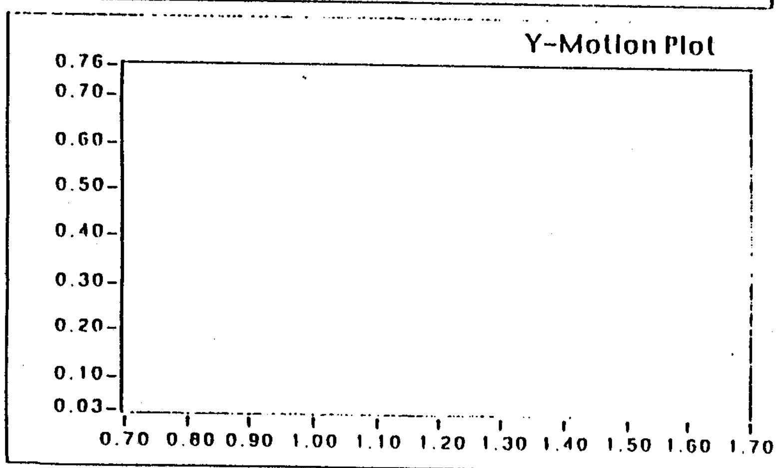
x(t) = −15.00 + 0.00t + 25.00t^2

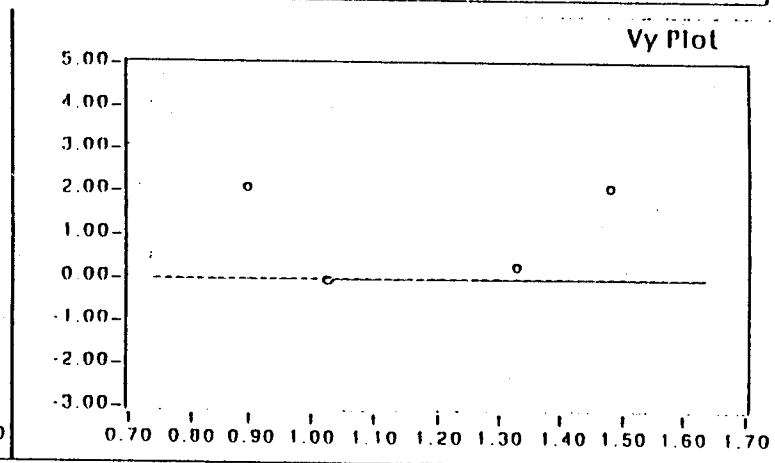
VxPrediction

Vx(t) = 0.00 + 0.00t

VxFit

Vx(t) = 0.00 + 0.00t





YPrediction

y(t) = 0.00 + 0.00t

YFit

y(t) = 0.00 + 0.00t

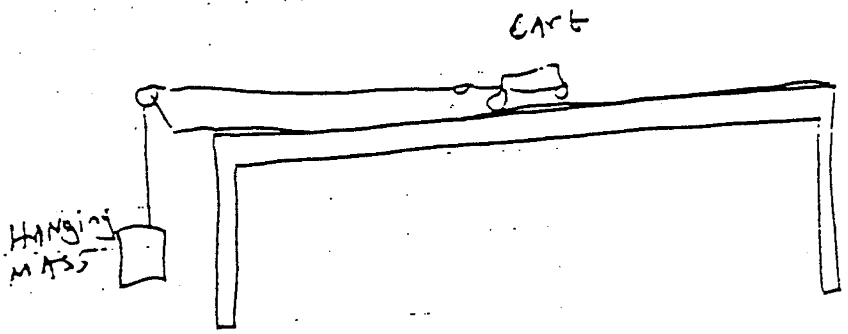
VyPrediction

Vy(t) = 0.00 + 0.00t

VyFit

Vy(t) = 0.00 + 0.00t

LAB III
prob 3



Equipment, Video camera, Stopwatch, metal cart, Hanging mass

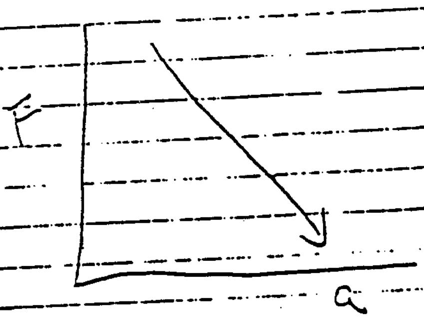
Purpose, Determine if the frictional force is more when an object speeds up or when it is coasting

Method, we Dropped the hanging mass and recorded the carts motion. This gives us the acceleration and then we can determine the frictional force.

My prediction, Frictional Force will be less when an object accelerates

$f = m_a g - (m_a + m_s)a$

$f = ma$



End

Statement of Problem

We were asked to find the linear velocity of an object rotating at a constant angular speed. Then we were asked to relate that to the distance from the axis of rotation and determine how that changes with respect to the axis. Our group took a stopwatch, a meter stick, and video analysis equipment and conducted our experiment. We gave the beam a push, which was free to rotate around its center, and recorded its motion with Lab View. While our group recorded its motion we also timed the revolution it underwent as well.

Prediction

There is one main prediction that needs to be discussed and that will be done now. We were asked to determine how the linear velocity of a point changes when the point is further from the axis of rotation at a constant angular velocity. Our group predicted that the linear velocity is predicted using this equation,

$$V=RW$$

Where W = (Rev) (2pie)/ (time) and R = the radius

There is a specific way to obtain the equation V=RW and that will be discussed now. First, you need to separate the point on the beam as an x and y component. The x component is RcosWT, the y component is RsinWT, when you have these components you can take the derivative to obtain the x and y components of the velocity. Once you have these components of the velocity you can square both of them and add them together under the radical to give you the equation V=RW. Also let it be known that if you took the derivative of the velocity components then you get the acceleration components. Then using the same procedure for the linear velocity you can get the acceleration, A=RW^2. IF there is any part of this reasoning that is unclear you can see the documents from my lab book attached to the end of this report.

Data and Results

Our group took a metal beam that rotated around its central axis and gave it a initial push to set itself into motion. While the beam was in motion we timed how long it took to make five revolutions. When we timed our beam, we determined it made five revolutions around its central axis in 7.85 seconds. With this information we could determine the angular velocity W. The way we determined this was done two ways, first we quickly calculated the value for W using

(rev)(2pie)/ (time) this gave us W equaling 4.04 rad/s.

Second, we calculated W using Lab View and the equation,

A+ Bsin (C+Dt) where A is the shift in the origin of the circle. B is the radius, C is theda, and D is the angular velocity W.

Once we knew what the angular velocity was, we could use W in the equation V= RW and determine our original question asked. How does the linear velocity of a point on the beam that is rotating change with respect to its radius with a constant angular velocity. To show this relationship I've included a table for easy viewing.

Linear Velocity	Radius	Angular Velocity
.202 m/s	.05m	4.04rad/s
.404m/s	.1m	4.04rad/s
.606m/s	.15m	4.04rad/s

It is clearly shown that with a constant angular velocity, the linear velocity increases when the radius of that point increases. If needed, you can also see the attached lab pages at the end of this report for further description.

Uncertainty

With every experiment, there is always an uncertainty that can take place and this will be discussed now. The main uncertainty that I think affected this experiment is the timing of the rotation of the beam. Mainly, because it is difficult to make an exact time measurement of the moment when the beam crosses the reference line for the fifth time. This is what we did to calculate W, and if your time is off then the value for W is slightly wrong which in return creates an error in the linear velocity.

Conclusion

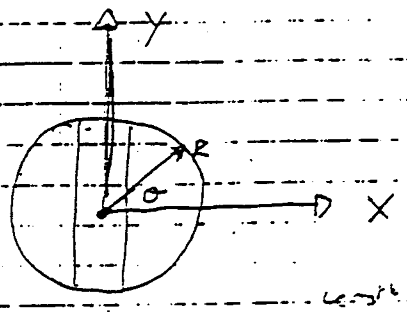
I will now recap my results and conclude what was observed for this lab. First we took a metal beam that rotated around its axis and recorded its motion with Lab View.

While the beam was rotating we timed how long it took to make five revolutions. We did this to determine the angular velocity W. We also determined this using an alternate method with Lab View. Once we knew the angular velocity W we plugged that value into the equation V=RW where R is the radius. Our group and I concluded that the linear velocity V increases when the radius increases of a point on the rotating beam with a constant angular velocity. We can also say that the linear acceleration increases as the radius increases because A= RW^2. There is also a graph attached to the end of this report showing these relationships for easy understanding. I think this lab was an overall good way for me to see these relationships physically.

Rotation — Translational

θ Angular position — x

$\frac{d\theta}{dt}$ = Angular velocity ω — $\frac{dx}{dt} = v$



length of vector

X component $r\cos\theta = r\cos\omega t$

length of vector

Y component $r\sin\theta = r\sin\omega t$

} x, y components position

angular displacement

$\theta = \omega t$

Derivative of position is velocity.

X component velocity $= -r\omega\sin\omega t$

Y component velocity $= r\omega\cos\omega t$

finding speed $\sqrt{(-r\omega\sin\omega t)^2 + (r\omega\cos\omega t)^2}$

$= \sqrt{(r\omega^2)(\cos^2\omega t + \sin^2\omega t)}$

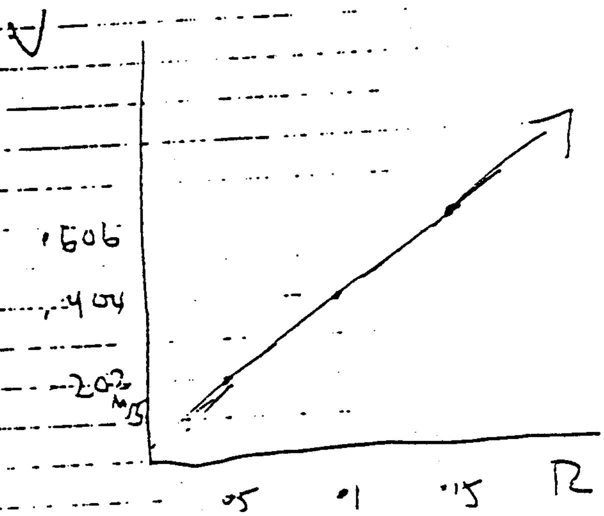
$= \sqrt{r\omega^2}$

Speed $= r\omega$

$V = r\omega$

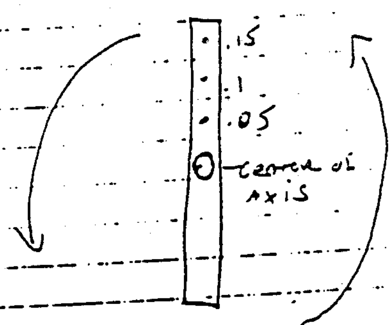
When A = 0 $\bar{w} = \frac{rev \times 2\pi}{time}$

when we had $\frac{5\ rev \times 2\pi}{7.85\ seconds} = 4.04$ RAD/s



Linear relationship

top view



L velocity = r w

(.05)(4.04) = .202 m/s

(.10)(4.04) = .404 m/s

(.15)(4.04) = .606 m/s

r w LV

Supplies

1) meter stick

2) Stop watch

3) LAB view