Re: Least Square fitting

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If k(DeltaL) = m*g and DeltaL = L − L0 then L = L0 + m*g/k.
Use standard least−squares fitting procedures to estimate L0 and g/k.

carlos.james.r@xxxxxxxxx wrote:

> Hello,
>
> I am have a problem with trying to figure out how my book came up with
> a solution to an odd number problem, it is stated as follows, "A
> student hangs masses on a spring and measures the spring's extension as
> a function of the applied force in order to find the spring constant k.
> Her measurements are:
>
> (mass (kg), Extension(cm)) = (200 , 5.1) , (300 , 5.5) , (400 ,
> 5.9) , (500 , 6.8) , (600 , 7.4) , (700 , 7.5) , (800 , 8.6) ,
> (900 , 9.4)
>
> There is an uncertainty of .2 in each measurement of the extension. The
> uncertainty in the mass is negligible. For a perfect spring, the
> extension DeltaL of the spring will be related to the applied force by
> the relation k(DeltaL)=mg, where DeltaL=L−L0 and L0 is the unstretched
> length of the spring. Use these data and the method of least squares to
> find the spring constant k, the unstretched length of the spring L0,
> and their uncertainties. Find Chi−Squrare for the fit and the
> associated probability."
>
> I first approached this problem by setting up the equation k(DeltaL)=mg
> so it can be used to solve for L0 and K via the least square method,
> since it sounds like that is how the problem wants us to solve for L0
> and K. The result was L=g/k*m+L0. However, I quickly ran into a problem
> since the measurements the problem gives you are the extensions and not
> the total length; thus, you cannot use my equation to solve for L0 and
> k via the least square method with the measured values given. I next
> consider the possibility that they just wanted you to solve for k via
> the least square method and then use the resulting value given to solve
> for L0. I switched the equation around and came up with
> (DeltaL)=g/k*m. I applied the least square method to solve for g/k and
> came up with a value and its uncertainty. I next tired setting up a
> system of linear equations to solve for L0, but I quickly found myself

going in circles since there really is no way to setup a system of equations to solve for L0 (or at least that I saw). What am I over looking? Could you guys help steer me in the right direction, because I cannot figure out how to solve for L0 but I can solve for k as I told you above, and the back of the book is no help since it only guess the resulting answer and now how it was gotten to.

Thanks guys

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