20100504---0722

In college in my statics class I had difficulty. For those of you who don' t know statics is the mathematical study of the forces that keep an object or paticle from moving such as buildings and bridges. While our class dealt with easy 2 d problems they are still quite challenging.The idea is simple "sum the forces on an object and they should equal zero".Simple enough but when you do a problem you tend to solve the problem with little knowledge of what is happening when the forces interact. Now our problem; I often wondered when you had 2 ropes holding a crate of any weight how to determine the force in the ropes without summing the forces.I mean, by figuring how one rope' s force subtracted by the force the other rope was holding would equal.It led me in an infinite loop (which I will show later in this essay) that I could not possibly solve.So it was back to summing the forces, but with a little curiosity of what those forces were doing.

Look at the first Problem excerpt from page 124 "Machine Elements in Mechanical Design" fourth edition, Robert L.Mott.This problem is easy to solve.

sin (45) * x + sin (45) * x = 1500
so that,
2 * sin(45) *x = 1500
so that,
x = 1500/(sin(45)*2)
the force in each rope "x" is 1060.66

That is one side to this story. What if I learned some new things in calculus and wanted to view the problem as two ropes with each taking some of the weight off of the other one?

[1500 - (sin(45)*1500)] * sin 45 + [1500 - (sin45*1500)...

It is a series with multiplication. An infinite loop.

sin(45)*[1500-(sin(45*[1500-(sin(45)*[1500-(sin(45)*[1500.............

What is important to note? The vector is solving an infinite multiplication loop! It would be impossible to solve without using the vector.

That is nice, but how do we use it?

Theory

The multiplication of a loop can be found by vector addtion. Or at least estimated.

The divison of a loop can be found by vector subtraction. Or at least estimated.

I will use the example of the salt tank found in many linear algebra and calculus texts. This problem is from page 523 "Calculus Concepts and Contexts", James Stewart.

The example is brief but the idea is profound.

The vector is drawn with salt of 0.03kg entering a "weight" of 20kg at a 89.71degree angle. There is a second force of "x" also at an 89.71 degree angle. This second force is multiplied by 30 min. The time when are solving for. By the way, 89.71 degrees is no willy-nilly number. It comes from the fact that 25/5000 = 0.005 and the inverse cosine equals 89.71 degrees. That is, the amount of liquid entering or leaving (which are equal in this problem).

Where x is the salt in tank at specific time (30 in our example):
[20kg + cos(89.71) * 0.03kg * 30] - [30 * cos(89.71 * x] = x
where [30 * cos(89.71 * x] is the "force" or salt that is leaving the tank at given time

[20kg + cos(89.71) * 0.03kg * 30] - [30 * cos(89.71 * x] = x
20.0045552898 - 0.15184x = x
-0.15184x = x - 20.0045552898
subtract x from both sides
-1.15184x = 20.0045552898
divide by -1.15184
x = 17.367477505

Plug into [30 * cos(89.71 * x]
30 * cos(89.71) * 17.367477505 = 2.510

the total salt in tank over 30 minutes equals 25* 30* 0.03 equals 42.5kg
42.5kg - 2.510 = 39.98
which is approximately 38kg

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similarly to estimate salt in tank the equation:
x / (cos(89.71) *30) = 0.03 * 30 + 20
simplify
x = 42.5 * 30 * cos(89.71)
subtract from x
x = 42.5
42.5 = 36.04667kg
approx. equal to 38kg

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It is important to note this is experimental. I just want so feedback. It needs tried with more than one example. I just wanted to illustrate the idea.