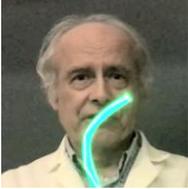


**Some Tips on Succeeding in Physics  
You Might Already Know This, But It Doesn't Hurt to Review It**



**Tip 1. Doc's Rule: Guessing the Pitch.** You take about 40 courses as an undergraduate to get your degree: 3 credit hours x 40 = 120 credit hours. The teachers are different, which is good. You have to figure out what is needed in each course to do well. Since we do not have infinite amount of time, it helps to figure out the teacher. I call this tip guessing the pitch. I have always liked baseball, so I will use baseball as the analogy.



Photo Courtesy Sonoma Stompers Baseball

Most teachers will point out the important stuff or give pointers in class. Some may have study guides. Don't be afraid to **ask the teacher** questions when in doubt. Old exams are great and college groups are known to keep files of old exams. **Working with your peers** can help greatly here. If you can guess the pitch coming at you, you have a better chance of getting a hit.

I had one unique teacher in grad school that did not teach the regular quantum mechanics, but taught us Jost functions. My college physics advisor had never heard of Jost functions! The quantum teacher went rogue, teaching whatever he was interested in. There were no standard homework problems. So I went to the library before the exam and practiced writing out a couple of pages of Jost functions and I decided no matter what is on the exam, I am putting this work down. I got the highest grade in the class by guessing close enough to the pitch. What I wrote down was correct information and teachers at least like correct info rather than garbage. As another example, there was a super hard question on the Ph.D. qualifying exam that no one got. People left it blank or wrote nonsense. However, by writing down  $F = ma$ , I got 8 out of 20 points.



**Tip 2. The Dr. Perkins Rule – There are a Limited Number of Problems that Can Appear on Exams.** I was talking to Dr. Perkins about upper-level physics courses and he reminded me of something important that I learned in grad school. In upper level courses there are a limited number of problems that can be done exactly and therefore suitable for exams. You can take advantage of this fact in studying. I will refer to this rule locally here in Asheville as the Dr. Perkins Rule.

Dr. Perkins said he had a teacher that gave them a booklet with all types of problems for an E&M course. There was a lot there, but it had everything. I will prepare for you in Exam Guide 2 such a collection, but it won't be absolutely everything - however, it will be solid. To help you have things in one place, I will cut and paste from our text and homework solutions. So though it will be about 20 pages, lots of the stuff will be cut and paste review material. If you can, **study with others**.

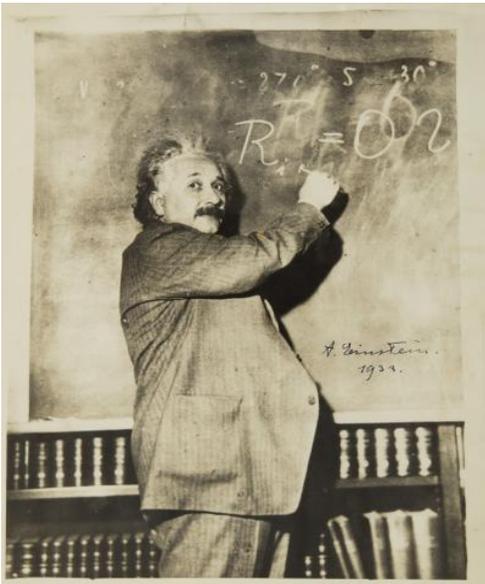
## A Danger – The Poh Illusion – Reading Physics Like a Comic Book

But there is another thing I discovered in grad school that applies here - a danger in getting such a compendium and using it the wrong way. Here is the danger. I prepared such a compilation of old Maryland qualifying exams by collecting numerous years of exams and working out solutions. The Qualifying Exam at Maryland is taken after one year to see if one can go on to get a Ph.D. And they give you 3 chances to pass the exam.



So I give my polished solutions, all copied neatly from scrap paper, to my buddy Poh, a smart Malaysian fellow grad student in physics. Poh is happy to get them, but I observe him flipping quickly through the pages in our large open office complex. Now, I know this Poh is smart, but he is not writing anything down. I ask him what is he doing. He stops, looks up and he says he understands everything there. He keeps going page after page, like reading a comic book. Well,

when Poh had to put a pencil in his hand and sit down to take the Ph.D. Qualifying Exam he could hardly remember anything to write down. He FAILED.



### Tip 3. The Cianfrani Rule – Always Study Mathematics with a Pencil in Hand.

Or, like Einstein here with a piece of chalk in hand.

The Poh illusion is that you can study physics like flipping through pages as if reading a comic book. The solution to the Poh illusion was given to me years earlier by my senior high school Mathematics Teacher Mr. Cianfrani in New Jersey. Here is the Cianfrani Law: Always Study Mathematics with a Pencil (or Pen) in Hand. This advice applies to physics and even more so to Theoretical Physics, which is synonymous with Mathematical Physics.

So when you study any Guide in Math, Physics, Astrophysics, Engineering, Chemistry, and our Theoretical Physics Guide for Exam 2, keep this rule in mind.

Study Guide 2 will become available soon. Always write things out. There is no better way to prepare for a math or physics exam. After all, when you take the exam, you have to write the stuff out. So study by writing the stuff out beforehand is the best way to go! And remember the big three things that matter in college (*What Matters in College* by Alexander W. Astin): **Time on Task, Access to the Teacher, Access to Peers.**

See you in class.

Doc, February 22-23, 2020

Asheville, North Carolina