

Problems

1. Sign the class list on the instructor's office door. If you are not on the list, add yourself in (print your name clearly) and sign it.
2. Calculate your class identification number (ClassID#) from your social security number (or your UMCP ID number) using the following formula:
$$\text{ClassID\#} = \text{SS\#} \bmod 999,$$
where $x \bmod(y)$ gives the remainder of x/y . For example, $999-21-3564 \bmod(999)$ will give a remainder of 777 (i.e. $\frac{999213564}{999} = 1000213\frac{777}{999}$).
3. For verification purposes, email the instructor your ClassID#. This is also to verify your email address (as listed in the official roster). If you have more than one email, indicate a preference for class communications. Also indicate how often you check your email.
4. A college friend of yours (not science inclined but math literate) asks you to explain to them what a 'Dirac delta function' is. In your own words and taking into account that your college friend has some math knowledge, how would you explain it to them?
5. A measure of the force F exerted by a stretched spring for small displacements x is given by Hooke's Law $F = kx$. What are the dimensions of the spring constant k ? Stretching the spring further, the force becomes nonlinear and may be represented by including an anharmonic term, $F = kx + \beta x^3$. What are the dimensions of β ? (*Adapted from a problem by Jeff Simpson*)
6. Derive the following expression: $(1 + x)^n \cong 1 + nx$ for $|x| \ll 1$. Explain all your steps. Assume nothing on the part of the grader!
7. Estimate the number of piano tuners in New York city? Clearly state all assumptions and approximations used.