

- Show your work.
 - This work must be submitted online as a **single .pdf** file through gradescope.
 - If you worked together with another student in the course, please document who you worked with and on what.
 - If you used a numerical program (such as Python, Wolfram Alpha, etc.), all scripts must be submitted in addition to the **.pdf**. You may submit these via email to Sun Myung and myself.
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1. (20 points) If X is a continuous random variable, show the following relation is true :

$$\text{Var}(aX + b) = a^2 \text{Var}(X)$$

where $\text{Var}()$ is the variance.

2. (20 points) (Stacey 9.13) The pdf for variable x is $f(s) = \frac{4}{\pi(1+x^2)}$ with $0 \leq x \leq 1$. Show that if a random number ξ between zero and one ($0 \leq \xi \leq 1$) is generated, the corresponding value of $x = \tan\left(\frac{\xi\pi}{4}\right)$.
3. (30 points) (Stacey 9.17) Plot the cumulative distribution function corresponding to the fission spectrum given approximately by:

$$\chi(E) = 0.453e^{-1.036E} \sinh \sqrt{2.29E}$$

where

$$10^4 eV \leq E \leq 10^7 eV$$

4. (30 points) (Stacey 9.19) Plot the pdf and the cdf for the cross section distribution in a region with $\Sigma_a = 0.15 \text{ cm}^{-1}$, $\Sigma_s = 0.08 \text{ cm}^{-1}$, and $\Sigma_f = 0.08 \text{ cm}^{-1}$.