In the name of God

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OPTIMIZATION METHODS IN PHYSICS

Exercise Set 9

(Due Date: 1400/10/06)

1. Mean value: Compute the following integration with mean value approach:

$$I_1 = \int_0^1 \sqrt{x + \sqrt{x}} dx$$

$$I_2 = \int_0^\pi \frac{1}{x^2 + \cos^2 x} dx$$

for each of above integrations select the uniform distribution and also select the proper distribution for generating x. Suppose the number of sampling in both case is 50000 and compare the precision of results with that of computed e.g. with Mathematica or Maple.

$$I_3 = \int_0^{0.7} dx \int_0^{0.8} dy \int_0^{0.9} dz \int_0^1 du \int_0^{1.1} dv (6 - x^2 - y^2 - z^2 - u^2 - v^2)$$

2. Solve the following integration with Monte Carlo:

$$\langle v_z^2 \rangle = \int_{-\infty}^{+\infty} dv_x \int_{-\infty}^{+\infty} dv_y \int_{-\infty}^{+\infty} dv_z v_z^2 p_v(\vec{v})$$

here $p_v(\vec{v}) = \left(\frac{\beta m}{2\pi}\right)^{3/2} \exp\left(-\frac{\beta m \vec{v}^2}{2}\right)$. You can imagine any values for free parameters.

Good luck, Movahed