In the name of God

Department of Physics
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MODERN PHYSICS

Exercise Set 2

(Due Date: 1402/12/22)

1. Probability Distribution Function Transformation: Suppose that the PDF of velocity is given by Maxwell-Boltzmann distribution.
A : For $D = 1$ dimension, determine the $P(E)$ if $E = mv^2/2$.
B : For $D = 2$ dimension, determine the $P(E)$ if $E = mv^2/2$.
C : For general D dimension, determine the $P(E)$ if $E = mv^2/2$.
D : Check your result derived in part **C**, for $D = 3$ dimension.

2. Compare the PDF for speed and Velocity of Maxwell-Boltzmann distribution in $D = 3$ dimension. Compute the maximum value of PDF, mean value of speed and velocity. Compute the fluctuations in speed and velocity. Explain the physical meaning of mentioned quantities.

$$P_s^{max}(v) = ?$$
$$P_v^{max}(v) = ?$$
$$\langle v \rangle_s = ?$$
$$\langle v \rangle_v = ?$$
$$\langle (v - \langle v \rangle)^2 \rangle_s = ?$$
$$\langle (v - \langle v \rangle)^2 \rangle_v = ?$$

Good luck, Movahed