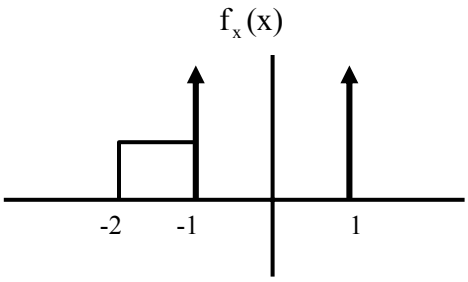
**ME 529** **EXAM 1** **October 15, 2001**

1) The probability density of a random variable X is given as

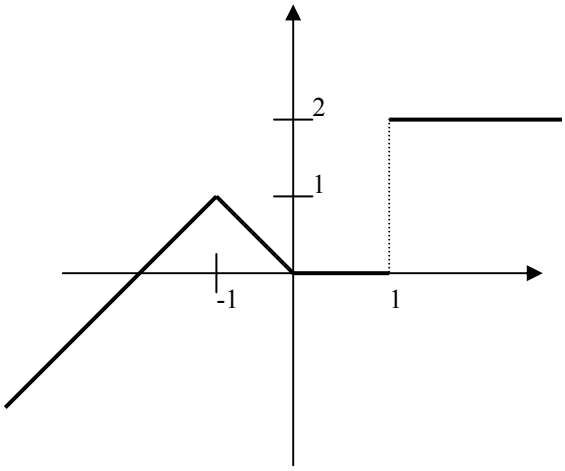
$$f_x(x) = \frac{1}{3}\{[u(x+2) - u(x+1)] + \delta(x-1) + \delta(x+1)\}$$




a) Evaluate mean and variance of X
b) Evaluate $\varphi_x(\omega)$
c) Evaluate P{-1.5< X <-0.5}.

2) For

$$Y = g(X) = \begin{cases} X+2 & for \quad X \le -1 \\ -X & for \quad -1 \le X \le 0 \\ 0 & for \quad 0 \le X < 1 \\ 2 & for \quad X \ge 1 \end{cases}$$




a) Determine the probability density of Y in terms of density of X.

b) For $f_x = e^{-x}u(x)$, determine $f_y(y)$.

c) Find E{Y}

3) Given $f_{xy}(x,y)$ and $Z = XY^3$,

a) Find $f_{zy}(z,y)$ and $f_z(z)$.
b) Evaluate $f_{zy}(z,y)$ and $f_z(z)$ for $f_{xy}(x,y) = y^3 e^{-xy^3}u(x)\,u(y)\,u(1-y)$.

c) Evaluate E(Z) and E(X)

d) Find $P\{-2 < X \le \infty \cap -1 < Y \le 0.5\}$.

{Hint $\int_0^\infty x^m e^{-ax}dx = \frac{m!}{a^{m+1}}$}.