Problem 49-1

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A:
We wish to show that $E[aX] = aE[X]$

$$E[aX] = \int_a^b a * x * p(x)dx$$

Because a is a constant it can be taken out

$$a * \int_a^b x * p(x)dx = aE[X]$$

B:

$$E[X_1 + X_2] = \int_a^b (x_1 + x_2) * p(x)dx = \int_a^b (x_1) * p(x) + (x_2) * p(x)dx$$

$$\int_a^b (x_1)*p(x)+(x_2)*p(x)dx = \int_a^b (x_1)*p(x)dx+\int_a^b (x_2)*p(x)dx = E[X_1]+E[X_2]$$

C:

$$Var[X] = E[(X - E[X])^2] = E[X^2 - 2XE[X] + E[X]^2]$$

Because the fact that E[X] is a constant and because of B we know that:

$$E[X^2 - 2XE[X] + E[X]^2] = E[X^2] - 2E[X]E[X] + E[X]^2] = E[X^2] + E[X]^2$$

D:

$x \mid x^2$

$2 \mid 4$

$2.5 \mid 6.25$

$2.25 \mid 5.0625$

2.235 | 4.995225

2.236 | 4.999696

E:
[4,8,7,7,4,2,3,1]
[4,8,7,7],[4,2,3,1]
[4,8],[7,7]
[4],[8] = [4,8]
[7],[7] = [7,7] combine [4,8],[7,7] = [4,7,7,8]
[4,2],[3,1]
[4],[2] = [2,4]
[3],[1] = [1,3]
combine [2,4],[1,3] = [1,2,3,4]
combine [4,7,7,8],[1,2,3,4] = [1,2,3,4,4,7,7,8]
[1,2,3,4,4,7,7,8]