Assignment 2

Problem 4.34: Standard Deviation of X

Given the probability distribution:

x	-2	3	5
$f(x)$	0.3	0.2	0.5

Step 1: Calculate the Expected Value (Mean), μX

The expected value μX is calculated using the formula:

μX=∑xi·f(xi)

Substitute the values:

μX= (−2×0.3)+(3×0.2)+(5×0.5)

μX=−0.6+0.6+2.5=2.5

So, the expected value (mean) μX is **2.5**.

Step 2: Calculate the Variance, σ^2X

The variance σ^2X is calculated using the formula:

σ^2X=∑(xi−μX)^2·f(xi)

Substitute the values:

σ^2X = [(- 2 - 2.5) ^ 2 * 0.3] + [(3 - 2.5) ^ 2 * 0.2] + [(5 - 2.5) ^ 2 * 0.5]

σ^2X = [(- 4.5) ^ 2 * 0.3] + [(0.5) ^ 2 * 0.2] + [(2.5) ^ 2 * 0.5]

σ^2X = (20.25 * 0.3) + (0.25 * 0.2) + (6.25 * 0.5)

σ^2X = 6.075 + 0.05 + 3.125 = 9.25

So, the variance σ^2X is 9.25.

Step 3: Calculate the Standard Deviation, σχ

The standard deviation ox is the square root of the variance: σχ = √9.25 ~ 3.041

So, the standard deviation ox is approximately 3.041.

Problem 4.10: Find μX and μY

Given the joint distribution:

$f(x,y)$		y = 1	2	3
x	1	0.10	0.05	0.02
	2	0.10	0.35	0.05
	3	0.03	0.10	0.20

Step 1: Calculate the Marginal Distribution fx(x) and fy (y)

The marginal distribution fx (2) is obtained by summing the joint probabilities across all values of y for each 2:

fx(1) = 0.10 +0.05 +0.02 0.17

fx(2) = 0.10+0.35 +0.05 0.50

fx(3) = 0.03+0.10 +0.20 = 0.33

So, the marginal distribution fX(x)f_X(x)fX(x) is:

x	1	2	3
$f_X(x)$	0.17	0.50	0.33

Similarly, the marginal distribution fy (y) is obtained by summing the joint probabilities across all values of a for each y:

fY(1) = 0.1 + 0.1 + 0.03 = 0.23

fY(2) = 0.05 + 0.35 + 0.1 = 0.5

fY(3) = 0.02 + 0.05 + 0.2 = 0.27

So, the marginal distribution fY(y) is:

y	1	2	3
$f_Y(y)$	0.23	0.50	0.27

Step 2: Calculate the Expected Values μX

For μX:

$$\mu_X = \sum_x x \cdot f_X(x)$$

Substitute the values:

μX = (1 * 0.17) + (2 * 0.5) + (3 * 0.33)

$\mu X = 0.17 + 1 + 0.99 = 2.16$

So, μX is 2.16.

For μY:

Substitute the values:

$\mu Y = (1 \times 0.23) + (2 \times 0.50) + (3 \text{ x } 0.27)$

$\mu Y = 0.23 + 1.00 + 0.81\ 2.04$

So, μY is 2.04.