Math 3339 Name: SOLUTION

Quiz #5

Please, show your work and write legibly. Recall the following R commands:

`dpois(x, lambda)`: $P(X = x)$ for $X \sim Poisson(\lambda)$

`ppois(q, lambda)`: $P(X \le q)$ for $X \sim Poisson(\lambda)$

(1)[4 Pts] A delivery company found that the number of complaints was 12 per years on average. Assuming that the number of complaints follows a Poisson distribution, calculate the probability of having

(a) at most 8 complaints in all of next year;

(b) 8 complaints or more in all of next year.

Let $X \sim pois(12)$

(a) $P(X \le 8) = \texttt{ppois}(8, 12) = 0.1550278.$

(b) $P(X \ge 8) = 1 - P(X \le 7) = 1 - \texttt{ppois}(7, 12) = 0.9104955.$

(2) [6 Pts] Let X and Y have the following joint p.d.f.

	x		
y	1	2	3
1	0.10	0.15	0.15
2	0.05	0.10	0.10
3	0.10	0.20	0.05

(a) Calculate the means with respect to X and Y

(b) Are X and Y dependent or independent? Justify our answer.

(c) Are x and Y positively correlated? negatively correlated? uncorrelated? Justify your answer?

(a) By direct computation the marginal probabilities are $f_1(x) = (0.25, 0.45, 0.30)$ and $f_2(y) = (0.40, 0.25, 0.35)$

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> px <-c(0.25,0.45,0.30)
> py <-c(0.40,0.25,0.35)
> x <- c(1,2,3)
> y <- c(1,2,3)
> EX <- sum(px*x)
> EY <- sum(py*y)
> print(EX) = 2.05
> print(EY) = 1.95
```

(b) Since $f_1(1)f_2(1) \neq f(1, 1)$, the X and Y are dependent.

(c) $E[XY] = 1(0.1)+2(0.15)+3(0.15)+2(0.05)+4(0.1)+6(0.1)+3(0.1)+6(0.2)+9(0.05) = 3.9$ $\sigma_{xy} = E[XY] - \mu_x\mu_y = 3.9 - (1.95)(2.05) = -0.0975$. Thus, X, Y are NEGATIVELY correlated.