Sardana_Module3HW.Rmd

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Problem 1 (a) Given function is Poisson distribution 1.# P(X=1)

```
P <- dpois(1, lambda = 3)
P

## [1] 0.1493612
```

Problem 1 b) # P(-3<X<5).

```
x_range <- c(-3:5)
sum(dpois(x_range, lambda = 3))

## [1] 0.9160821
```

Problem2

```
n=5
p = 1/7
```

Problem3

Binomial distribution #(n = 3, p = 0.25) # To compute a) #P(Y ≤ 2)

```
pbinom(2,size = 3, p = 0.25)

## [1] 0.984375
```

b) E(Y)

```
EY <- 3*0.25
EY

## [1] 0.75
```

c) Var(Y)

```
VarY <- 3 * 0.25 * (1-0.25)
VarY

## [1] 0.5625
```

Problem 4

Chi square distribution a) P(2 < X < 5)

```
pchisq(5,df=5) - pchisq(2,df=5)

## [1] 0.4332648
```

b) E(X)

```
a <- 5
EX <- a
EX

## [1] 5
```

c) Var(X)

```
a <- 5
Var_X <- 2 * a
Var_X

## [1] 10
```

d) Monte Carlo simulation yes answer a) follows monte carlo stimulation

```
n <- 100000
df <- 5
chis_estimate <- rchisq(n,df)
chis_estimate <- sum(chis_estimate > 2 & chis_estimate < 5)/n
chis_estimate

## [1] 0.43225
```

Problem 5 Chisquare distribution a) Compute E(Y) and Var (Y)

```
E_X = 8

E_Y = 3*E_X-5
E_Y

## [1] 19

Var_X <- 12
Var_Y <- 3^2*Var_X
Var_Y

## [1] 108
```

b) No it does not follow a Chisquare distribution with degree of freedom m = 6
Variance should be 38 as Ey value is 19 and variance should be 2*19 = 38.

Problem 6

Normal distribution

a) Probability that a randomly chosen patient have the Zyxin gene expression values between 1 and 1.6

```
mu <- 1.6
deviation <- 0.4
probability <- pnorm(1.6, mean = mu, sd = deviation) - pnorm(1, mean = mu, sd
= deviation)
probability
```

```
## [1] 0.4331928
```

b) Monte Carlo Simulation # Estimate the probability as the proportion of samples between 1 and 1.6

```
n <- 500000
mu <- 1.6
deviation <- 0.4

simulation <- rnorm(n, mean = mu, sd = deviation)

estimate_value <- mean(simulation >= 1 & simulation <= 1.6)
estimate_value

## [1] 0.43304
```

c)# Probability that exactly 2 out of 5 patients have the Zyxin gene expression values between 1 and 1.6 Binomial distribution

```
#probability <- pnorm(1.6, mean = mu, sd = deviation) - pnorm(1, mean = mu,
sd = deviation)
#probability
n <- 5
p <- probability
prob <- dbinom(2, size = n, prob = p)
prob

## [1] 0.3417185
```