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Problem Set 3 Answers

Question 1

a. Normal distribution and standard normal distribution: A bell shaped and symmetric around the mean distribution with mean of 0 and variance of 1 in standart version.

b. Chi-squared distribution: A type of distribution used in hypotheses tests and sum of squared independent normal random variables.

c. t distribution: t distribution is like normal distribution but with fatter tails.

d. F distribution: The F distribution results from the ratio of two scaled chi-square distributions.

e. Independently and identically distributed (i.i.d): i.i.d refers to independent random variables with same probability distribution.

f. Sampling distribution: Sampling distribution s is the probability distribution of the statistics of many samples drawn from a population.

g. Law of large number: Law of Large number says that as size of sample increase, avarage of sample gets closer to the mean of population

h. Central limit theorem: Central limit theorem states that as size of sample increase, sample avarage distribution gets closer to the normal distribution.

i. Consistency: Consistency means that the closeness of an estimator to the truth increases as the sample size increases.

j. Asymptotic distribution: The asymptotic distribution describes the limiting behaviour of a succession of distributions as the sample size approaches infinity**.**

Question 2

```
> ?pnorm
> pnorm(3, mean = 1, sd = 2, lower.tail = TRUE)
[1] 0.8413447
> pnorm(0, mean = 3, sd = 3, lower.tail = FALSE)
[1] 0.8413447
> pnorm(52, mean = 50, sd = 5, lower.tail = TRUE) -pnorm
(40, mean = 50, sd = 5, lower.tail = TRUE)
[1] 0.6326716
```

Question 3

```
> ?pchisq
> pchisq(7.78, df = 4,lower.tail = T)
[1] 0.9000223
> pchisq(18.31, df = 10,lower.tail = F)
[1] 0.04995417
> ?pf
> pf(q = 1.831, df1 = 10, df2 = Inf, lower.tail = F)
[1] 0.04995417
> pchisq(1.0, df = 1,lower.tail = F)
```

Question 3 d. Since F(df1, Inf) ≈ ChiSq(df1)/df1 and 1.831 = 18.31/10

Quesiton 4

a.

```
> pnorm(10.4, mean = 10,sd = sqrt(4/20),lower.tail = T)
-pnorm(9.6, mean = 10,sd = sqrt(4/20),lower.tail = T)
[1] 0.6289066
> pnorm(10.4, mean = 10,sd = sqrt(4/100),lower.tail =
T)-pnorm(9.6, mean = 10,sd = sqrt(4/100),lower.tail =
T)
[1] 0.9544997
> pnorm(10.4, mean = 10,sd = sqrt(4/1000),lower.tail =
T)-pnorm(9.6, mean = 10,sd = sqrt(4/1000),lower.tail =
T)
[1] 1
>
```

b. and c.