Theory Homework 11

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12.

a.

$$P(X_{(7)} \leq 3) = \sum_{7}^{20} \binom{20}{k} (0.3)^k (1-0.3)^{20-k}$$

```
sum(dbinom(size = 20,prob = 0.3,x=c(7:20)))
```

```
## [1] 0.3919902
```

###b.

$$P(X_{(8)} \geq 5) = 1 - \sum_{8}^{20} \binom{20}{k} (0.4)^k (1-0.4)^{20-k}$$

```
1 - sum(dbinom(size = 20,prob = 0.4,x=c(8:20)))
```

```
## [1] 0.4158929
```

###c.

$$P(X_{(20)} \leq 7) = \sum_{20}^{20} \binom{20}{20} (0.2)^k (1-0.2)^{20-k} = (0.2)^{20}$$

```
sum(dbinom(size = 20,prob = 0.2,x=c(20)))
```

```
## [1] 1.048576e-14
```

```
(0.2)^20
```

```
## [1] 1.048576e-14
```

###d.

$$P(X_{(4)} = 3) = \sum_{4}^{20} \binom{20}{k} (((0.3)^k (1-0.3)^{20-k}) - ((0.2)^k (1-0.2)^{20-k}))$$

```
sum(dbinom(size = 20,prob = 0.3,x=c(4:20)) - dbinom(size = 20,prob = 0.2,x=c(4:20)))
```

```
## [1] 0.3043621
```