Today:

1. Probability Mass/Density Function
2. Cumulative Distribution Function

In Class Exercises:

1. The number of injury claims per month is modeled by a random variable $N$ with

$$P[N = n] = \frac{1}{(n+1)(n+2)}, \text{ where } n \geq 0.$$ 

Determine the probability of at least one claim during a particular month, given that there have been at most four claims during that month.

2. The lifetime of a machine part has a continuous distribution on the interval $(0,40)$ with probability density function $f$, where $f(x)$ is proportional to $(10 + x)^{-2}$

Calculate the probability that the lifetime of the machine part is less than 6.
3. A group insurance policy covers the medical claims of the employees of a small company. The value, $V$, of the claims made in one year is described by

$$V = 100,000Y$$

where $Y$ is a random variable with density function

$$f(y) = \begin{cases} 
k(1-y)^4 & \text{for } 0 < y < 1 \\ 
0 & \text{otherwise,} \end{cases}$$

where $k$ is a constant.

What is the conditional probability that $V$ exceeds 40,000, given that $V$ exceeds 10,000?

4. An insurer's annual weather-related loss, $X$, is a random variable with density function

$$f(x) = \begin{cases} 
\frac{2.5(200)^{2.5}}{x^{3.5}} & \text{for } x > 200 \\ 
0 & \text{otherwise.} \end{cases}$$

Calculate the difference between the 25th and 75th percentiles of $X$. 