MAS Ü8

7.) $\mathbb{P} = \Gamma(3,1)$ ... Gammaverteilung

ges: Verteilungsfunktion und $\mathbb{P}([1,2])$

$$p(x) = \frac{x^{3-1} \cdot 1^3}{\Gamma(3)} \cdot e^{-1x} = \frac{x^2}{\int_0^\infty t^{3-1} \cdot e^{-t}\, dt} \cdot \frac{1}{e^x}$$

$$\int t^2 \cdot e^{-t}\, dt = -e^{-t} \cdot t^2 + 2\int e^{-t} \cdot t\, dt = -e^{-t} \cdot t^2 + 2\left(-e^{-t} \cdot t + \int e^{-t}\, dt\right)$$

$$= -e^{-t} \cdot t^2 - 2e^{-t} \cdot t - 2e^{-t} = -e^{-t} \cdot (t^2 + 2t + 2)$$

$$\lim_{\beta \to \infty} \int_0^\beta t^2 \cdot e^{-t}\, dt = \lim_{\beta \to \infty} -e^{-\beta}(\beta^2 + 2\beta + 2) - (-e^0 \cdot 2) = \lim_{\beta \to \infty} -\frac{\beta^2 + 2\beta + 2}{e^\beta} + 2$$

$$= \lim_{\beta \to \infty} -\frac{2\beta + 2}{e^\beta} + 2 = \lim_{\beta \to \infty} -\frac{2}{e^\beta} + 2 = 0 + 2 = 2$$

$$p(x) = \frac{x^2}{2e^x} \qquad F(x) = \int_0^x \frac{t^2}{2e^t}\, dt$$

$$\int \frac{1}{2} \cdot t^2 \cdot e^{-t}\, dt = \frac{1}{2} \cdot \left(-e^{-t} \cdot (t^2 + 2t + 2)\right)$$

$$\int_0^x \frac{1}{2} \cdot t^2 \cdot e^{-t}\, dt = -\frac{1}{2} e^{-x} \cdot (x^2 + 2x + 2) + \frac{1}{2} \cdot e^{-0}(2) = -\frac{1}{2} \cdot e^{-x}(x^2 + 2x + 2) + 1 = F(x)$$

$$\mathbb{P}([1,2]) = F(2) - F(1) = -\frac{1}{2} \cdot e^{-2}(4 + 4 + 2) + 1 - \left(-\frac{1}{2} \cdot e^{-1}(1 + 2 + 2) + 1\right)$$

$$= -5 \cdot e^{-2} + \cancel{1} + \frac{5}{2} \cdot e^{-1} - \cancel{1} = 0{,}243022$$