

ECE 401  
HW #5

①

- 1) Plot  $P_T(\gamma)$  using Chebyshev-Gauss quadrature if

$$E[e^{\theta\Phi}] = \exp\left[\lambda\left(\int_0^1 M_t(\theta) dt - 1\right)\right],$$

where

$$M_t(\theta) = \left(\frac{\beta(t)}{\beta(t) - \theta}\right)^p$$

for  $p = 1/2, 1, 2$  and  $\beta(t) = e^t$ ,  $\lambda = 10$ .

- 2) For problem 1, show mathematically that

$$\lim_{\gamma \rightarrow \infty} P_T(\gamma) = \frac{e^{-\lambda}}{2} \approx 2.27 \times 10^{-5} \text{ for } \lambda = 10.$$

- 3) Consider a multipath channel in which  $f_t(f)$  has second moment  $e^{-t}$ . Assume that the delays are deterministic with  $T_k = k-1$  for  $k=1, 2, \dots$ . Find the delay spread.

- 4) If  $G = e^X$  where  $X \sim N(m, \sigma^2)$ , find the moments of  $G$ ,  $E[G^n]$  for  $n=1, 2, \dots$ . Also find the density of  $G$ .