Math-Stat. (2)	$_{ m HW}$	
Instructor: Yu-Ling Tseng	(Due on 20220602)	

- 1. Let  $X_1, \ldots, X_n$  be a random sample from  $N(\mu, \sigma^2)$ .
  - (a) If  $\sigma^2$  is known, find a minimum sample size *n* to quarantee that the 95% twosided UMAU confidence interval for  $\mu$  will have length no more than  $\sigma/4$ .
  - (b) If  $\sigma^2$  is unknown, how to find a minimum sample size *n* to quarantee, with probability 0.9, that the 95% two-sided UMAU confidence interval for  $\mu$  will have length no more than  $\sigma/4$ ?
- 2. Let a random variable  $X \sim f(x; \theta)$ , where f is a p.d.f. defined as

$$f(x;\theta) = \frac{e^{(x-\theta)}}{(1+e^{(x-\theta)})^2}, \quad x \in R, \ \theta \in R.$$

Based on one observation, X, find the UMA one-sided  $1 - \alpha$  confidence interval of the form  $\{\theta : \theta \leq U(X)\}$ .

- 3. Let X be a single observation from  $Beta(\theta, 1), \theta > 0$ .
  - (a) Let  $Y = -(\ln X)^{-1}$ . Evaluate the confidence coefficient of the interval [Y/2, Y], that is: calculate  $\inf_{\theta>0} P_{\theta}(\theta \in [Y/2, Y])$ .
  - (b) Find a pivot-based confidence interval having the same confidence coefficient as the interval in part (a).

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