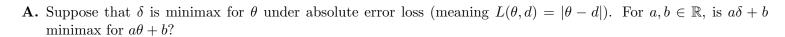
## MATH 281B - Midterm 1 - Winter 2019

Use the notation defined in the summary sheet; otherwise, define any symbol you use. If you use a result from the summary sheet, specify it (e.g., "by M1"). Be concise and clear.

## Problem 1.



**B.** Prove A1 in the summary sheet.

C. Prove M2 in the summary sheet.

<b>D.</b> Derive the Bayes estimator for $\theta$ under the loss $L(\theta,d) = 1_{ d-\theta >c}$ , where $c>0$ is given.
<b>E.</b> Suppose we want to estimate $\theta \in \Omega = [a, b]$ based on $X \sim P_{\theta}$ under a loss function $L(\theta, d)$ which, for each $\theta$ fixed, is strictly decreasing on $(-\infty, \theta]$ and strictly increasing on $[\theta, \infty)$ . Show that any estimator taking values outside
[a, b] with positive probability under some $P_{\theta_0}$ is inadmissible.
<b>F.</b> Consider a setting where $X \sim \text{Bin}(n,\theta)$ and the goal is to estimate $\theta \in [0,1]$ under squared error loss. The
estimation problem is invariant with respect to the group $G$ induced by the transformation $gx = n - x$ . Provide a sufficient condition on a prior $\Lambda$ , with density $\lambda$ with respect to the Lebesgue measure on $[0,1]$ , such that the corresponding Bayes estimator is equivariant with respect to the action of $G$ .

