

**8.21.** Part (2) follows from (1) because  $S_n$  is a mean-zero martingale. To prove part (1) we apply Doob's inequality to the submartingale defined by  $Z_n := |X_n|^p$ , using the fact that  $P\{\max_{1 \leq i \leq n} |X_i| \geq \lambda\}$  is equal to  $P\{\max_{1 \leq i \leq n} Z_i \geq \lambda^p\}$ .