

Let  $X_n$  be i.i.d. with  $P(X_n = 1) = p$  and  $P(X_n = -1) = 1 - p$ . Let

$$S_n = S_0 + X_1 + \dots + X_n.$$

Find a number  $a$  such that  $S_n - an$  is a martingale.

Find two different numbers  $b > 0$  such that  $b^{S_n}$  is a martingale.