Assignment 8

1) • customers net deposits/withdrawals $\sim N(\mu_c, \sigma_c^2)$
   • risky asset $\sim N(\mu_a, \sigma_a^2)$

variables:
- cash c_t
- risky investment $x_t < c_t$
- risky asset random variable R_t
- deposits/withdrawals D_t
- borrowed money y_t
- risky asset total $X_{tot,t}$

constraints:
- $c_t + y_t - D_t - x_t \geq K \cdot \cot\left(\frac{\pi c}{2C}\right)$

Maximize $\mathbb{E}\left[U(X_{tot,T} - (1+R)y_{T-1})\right]$

states: $(c_t, X_{tot,t}, t)$ - beginning of day

actions: (y_t, x_t) - end of day

transitions: $C_{t+1} = \begin{cases} (c_t - D_t) + (y_t - x_t) - (1+R)y_{t-1}, & \text{if } c \geq C \\ (c_t - D_t) + (y_t - x_t) - (1+R)y_{t-1}, & \text{if } c < C \\ \quad - K\cot\left(\frac{\pi c}{2C}\right) \end{cases}$

$$X_{tot,t+1} = X_{tot,t}(1 + R_t) + x_t$$

rewards: 0, for $t = 0, 1, \dots, T-1$

$X_{tot,T} - (1+R)y_{T-1}$, for $t = T$

2)