6. (a) \( 20 - 2(S_T - 80)^+ + 4(S_T - 90)^+ - 4(S_T - 100)^+ \\
+ 4(S_T - 110)^+ - 2(S_T - 120)^+ \)

(c) \( S_T = 20, 90, 100, 110, 120 \)

\( \text{Payoff} = 20, 0, 20, 0, 20 \)

7. (a) \( S_0 = 130, K = 100 \)

100-strike put is out of money.

(b) \( \text{Value} = e^{r(T-t)} (F_{t,T} - K) = C - P \)
\[ = 36.09 - 3.00 = 33.09 \]

(c) \( F_{t,T} = 33.09 e^{r(T-t)} + K \)
\[ = 33.09 e^{0.05 \times 1} + 100 = 134.79 \]

(d) \( F_{t,T} = e^{r(T-t)} S - D \) (one dividend at end of year)
\[ \Rightarrow D = 130 e^{0.05 \times 1} - F_{t,T} = 130 e^{0.05} - 134.79 = 1.88 \]

(e) If there is no dividend, the replicating cost of forward is
\[ 130 e^{0.05 \times 1} = 136.66, \quad \text{where} \quad \text{the option-implied forward is} \quad 134.79. \]

Trade: Short AAPL, long call, short put. Net = 130 - 36.09 + 3 = 96.91.
Save money in bank to receive 96.91 e^{0.05 \times 1} = 101.88 at expiry.

The three contracts lead to pay $100 at expiry & no AAPL position. Net $1.88 arbitrage profit.
6 (a) \( 20 - (S_T - 80)^+ + 2(S_T - 90)^+ - 2(S_T - 100)^+ + 2(S_T - 110)^+ - (S_T - 120)^+ \)

(c) \( S_T = 10, 90, 100, 110, 500 \)
Payoff = 20, 10, 20, 10, 20

7. (a) Put is out of the money
(b) Value = \( e^{-r(T)} (F_{T,T} - K) = C - P = 36.09 - 3.00 = 33.09 \)
(c) \( F_{T,T} = 33.09 e^{0.06x1} + 100 = 135.14 \)
(d) \( F_{T,T} = e^{r(T)} S - D \)
\[ D = e^{0.06x1} \times 130 - 135.14 = 2.90 \]
(e) If there is no dividend, the replicating cost of forward is
\( 130 \times e^{0.06x1} = 138.04 \), whereas the option-implied price is 135.14.

Trade:
(a) Short AAPL (spot), Long call, Short put.
(b) Net = 130 - 36.09 + 3 = 96.91.
(c) Save money in bank to become 96.91 \( e^{0.06x1} = 102.90 \) at expiry.
(d) At expiry, the 3 contracts not a payout of $100, with no AAPL position. That will leave us with $2.90 of arbitrage profit.