Question 1:
We use the Call/Put parity formula:

\[ C(K,T) - P(K,T) = S - PV(Div) - Ke^{-rT} \]

Thus,

\[ 4.29 - 2.64 = 32.00 - PV(Div) - 30e^{-0.04*0.5} \]

We then get that \( PV(Div) = 0.944 \).

Question 2:

a) \( C - P = S_0 - Ke^{-rt} \rightarrow 75 - 45 = 800 - 815e^{-r} \rightarrow r = 5.68\% \)

b) Demonstrate the arbitrage opportunity

\[ C_{\text{synthetic}} = S_0 - Ke^{-rT} + P = 800 - 815e^{-0.05} + 45 = 69.748 < C_{\text{market}} = 75 \]

Buy \( C_{\text{synthetic}} \) and sell \( C_{\text{market}} \)

<table>
<thead>
<tr>
<th>Transaction at t = 0</th>
<th>Cash Flow</th>
<th>t=1 St &gt; K Cash Flow</th>
<th>t=1 St &lt; K</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sell ( C_{\text{market}} )</td>
<td>+75</td>
<td>(St - K)</td>
<td>0</td>
</tr>
<tr>
<td>Buy Stock</td>
<td>-800</td>
<td>+ St</td>
<td>St</td>
</tr>
<tr>
<td>Buy Put</td>
<td>-45</td>
<td>0</td>
<td>K-St</td>
</tr>
<tr>
<td>Sell bills</td>
<td>+815e^{-0.05}</td>
<td>-K</td>
<td>-K</td>
</tr>
<tr>
<td>profit</td>
<td>+5.25</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Question 3:

\[ C - P = S_0 - Ke^{-rt} \rightarrow 1 - 0.75 = 25 - 25e^{-0.25r} \rightarrow r = 0.04 \]

Question 4:

a) \( S_{0 \text{ synthetic}} = C - P + PV(DIV) + Ke^{-rt} = C - P + 44e^{-0.05*0.25} + e^{-0.05*0.2} \rightarrow LEND = 44.44 \)
b) $S_0^{\text{synthetic}} = 45.341 > 45$ Buy actual stock, sell synthetics stock

Question 5:

$C - P = S_0 e^{\xi t} - K e^{-rt} \rightarrow K e^{-rt} = S_0 e^{\xi t} - C + P \rightarrow K = 36.09$

# of shares = $10000 / 36.09 * e^{-0.01} = 274.3$