ANSWERS TO HOMEWORK #1:

1) $$$\text{Low cost, product differentiation, quality, delivery speed, delivery reliability, flexibility.}$$$

Dell company mainly distinguishes itself from its competitors in the USA by product differentiation. Dell emphasizes on customization and variety by including the customers in the manufacturing cycle by carrying out a built-to-order mechanism.

2) a) $$32,000 + 60 \times 10,000 = CP + 70 \times 1,000$$

$$\text{CP} = 22,000$$

b) Since $$18,000 < 22,000$$ (the break-even contract price)

then, choose to outsource

c) $$32,000 + 60 \times Q = 180,000 + 70 \times Q$$

$$\text{Q} = 14,000$$ Breakeven quantity

If Vestel management forecasts the demand to be at least 14,000 units, then they can decide to manufacture in-house.

3) a) For the first check,

$$Y(1) = a \times 1^{-b}$$

$$60 \text{ min}$$

$$60 = a$$

$$Y(10) = 60 \times 10^{-b}$$

$$45 \text{ min}$$

$$\ln(45) = \ln(60) - b \times \ln(10)$$

$$b \times \ln(10) = \ln(60) - \ln(45)$$

$$b = 0.125$$ Learning rate $$L = 2^{-b} = 2^{-0.125} = 0.917$$

b) Assume $$n^{th}$$ unit is the one that the clerk will be able to work at 30 minutes (i.e. 2 checks per hour).
\[ Y(n) = 60^{\sqrt{0.125}} \]

30 min

\[ 30 = 60^{\sqrt{0.125}} \]

\[ \ln(0.5) = -0.125 \ln(n) \]

\[ \Rightarrow n = 256 \] Then, the clerk will be able to complete the 256th check in half an hour.

4) a)

\[ \begin{array}{c|c}
\text{hours required} & \text{cumulative # of units} \\
\hline
5 & 50 \\
4 & 100 \\
3 & 200 \\
2 & 400 \\
1 & 600 \\
\end{array} \]

b-c)

\[ \begin{array}{c|c}
\ln (\text{# of cumulative units}) & \ln (\text{hours required}) \\
3.912 & 1.825 \\
4.605 & 1.589 \\
5.298 & 1.435 \\
5.991 & 1.308 \\
6.397 & 1.224 \\
\end{array} \]
To find the equation of the line:

\[
\frac{y_2 - y_1}{x_2 - x_1} = \frac{y - y_1}{x - x_1}
\]

where approximately \( y_1 = 1.525 \) \( y_2 = 1.224 \)

\[
x_1 = 3.912 \quad x_2 = 6.397
\]

\[
\frac{1.224 - 1.825}{6.397 - 3.912} = \frac{y - 1.825}{x - 3.912}
\]

\[\Rightarrow -0.601 \ln (x) + 2.351 = 2.485 \ln(Y(x)) - 4.535\]

\[\Rightarrow \ln(Y(x)) = 2.771 - 0.242 \ln(x)\]

For \( x = 1\), \( \ln(Y(1)) = 2.771 - 0.242 \times 0 = 2.771 \)

\[Y(1) = 15.975\]

\[L = 2^{-b}\] where \( b = 0.242\)

\[L = 0.846 \Rightarrow 84.6\%\]

d) \( \ln (Y(x)) = 2.771 - 0.242 \times \ln(x)\)

\[\Rightarrow \ln(2.9) = 2.771 - 0.242 \times \ln(x)\]

\[\Rightarrow \ln(x) = 7.05\]

\[x = 1154\] part will be produced in 2.9 hours.