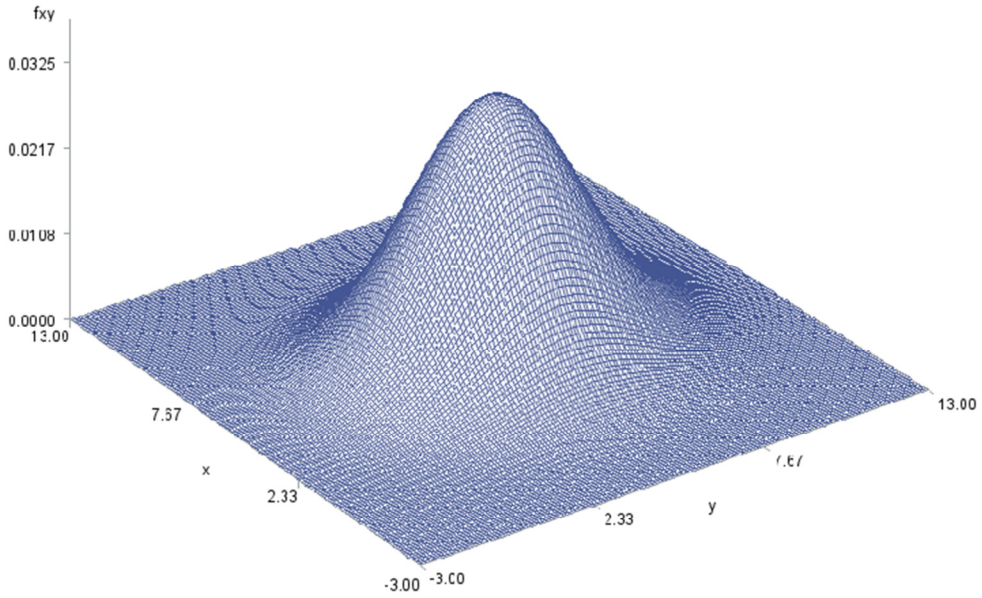
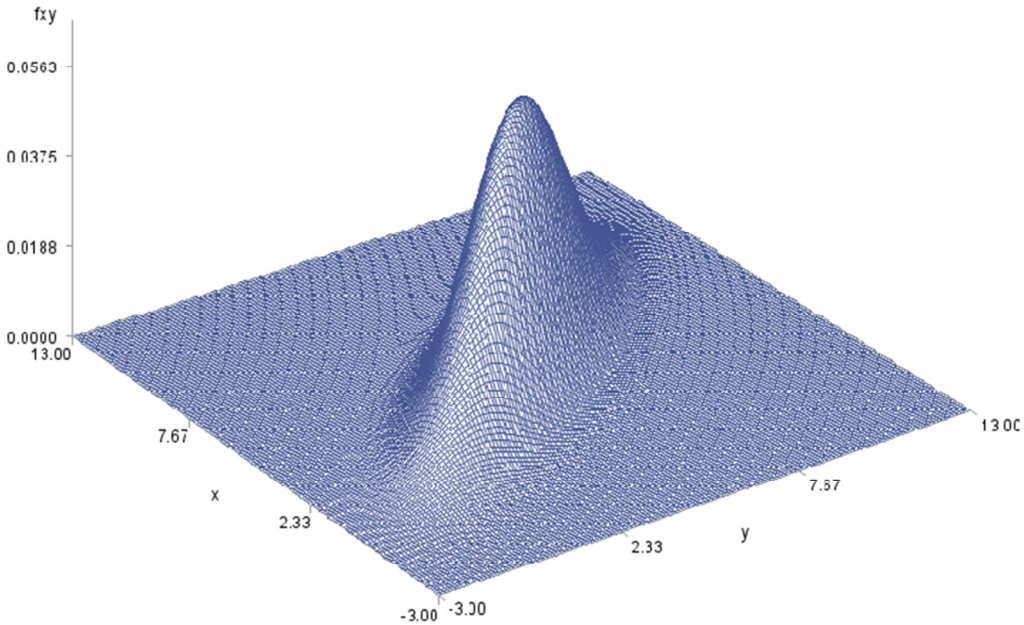
5.

(a)

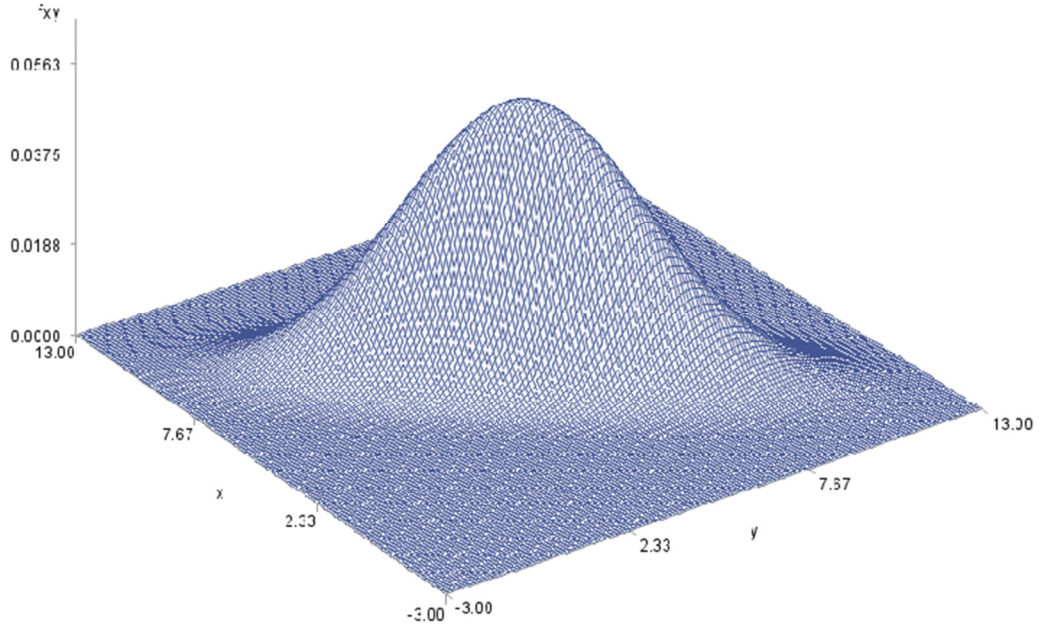
i. For $\boldsymbol{\Sigma} = \begin{pmatrix} 4 & 0 \\ 0 & 6 \end{pmatrix}$:



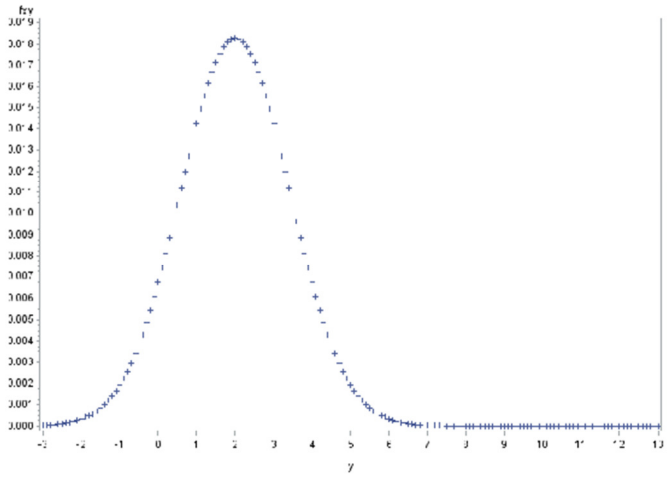
ii. For $\boldsymbol{\Sigma} = \begin{pmatrix} 4 & 4 \\ 4 & 6 \end{pmatrix}$:



iii. For $\boldsymbol{\Sigma} = \begin{pmatrix} 4 & -4 \\ -4 & 6 \end{pmatrix}$:



(d)



The shape of the graph looks like a normal density. The conditional density $f(y|x=2)$ is a normal density. The normalizing constant for the above graph must be calculated to make it a valid density.