#4

$$T(x,y) = e^x \cos(y) + e^y \cos(x)$$

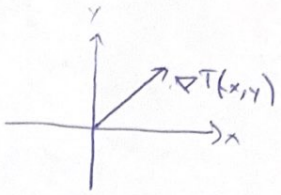
$$\frac{\partial T}{\partial x} = e^x \cos(y) - e^y \sin(x)$$

$$\frac{\partial T}{\partial y} = -e^x \sin(y) + e^y \cos(x)$$

$$\nabla T(x,y) = \begin{pmatrix} e^x \cos(y) - e^y \sin(x) \\ -e^x \sin(y) + e^y \cos(x) \end{pmatrix}$$

a) direction of steepest Ascent is $\nabla T(x,y)$

at $(0,0)$ $\nabla T(x,y) = \begin{pmatrix} 1(1) - 1(0) \\ -1(0) + 1(1) \end{pmatrix} = \begin{pmatrix} 1 \\ 1 \end{pmatrix}$



Rate $= d\,\nabla T(0,0)^T$

$$\begin{bmatrix} 1 \\ 1 \end{bmatrix} \cdot \begin{bmatrix} 1 & 1 \end{bmatrix} = 2$$

b) direction of steepest desend is $-\nabla T(x,y)$

at $(0,0)$ $-\nabla T(x,y) = \begin{pmatrix} -1 \\ -1 \end{pmatrix}$