

1.a) $f(x,y) = 5x^2 + y$

$$\frac{\partial^2 f}{\partial x^2} = 10y$$

$$\frac{\partial^2 f}{\partial y^2} = 0$$

$$\frac{\partial^2 f}{\partial x \partial y} = 10x$$

$$\begin{bmatrix} 10y & 10x \\ 10x & 0 \end{bmatrix}$$

2.a) $f(x,y) = xy^2 + \cos(2x)$

$$\frac{\partial^2 f}{\partial x^2} = -4\cos(2x)$$

$$\frac{\partial^2 f}{\partial x^2} = 2x$$

$$\frac{\partial^2 f}{\partial x \partial y} = 2y$$

$$\frac{\partial f}{\partial x} = y^2 - 2\sin(2x)$$

$$\frac{\partial f}{\partial y} = 2xy$$

$$\begin{bmatrix} -4\cos(2x) & 2y \\ 2y & 2x \end{bmatrix}$$

$$X = \frac{n\pi}{2} \quad n \in \mathbb{Z}$$

$$y^2 - 2\sin(2x) = 0$$

$$2xy = 0$$

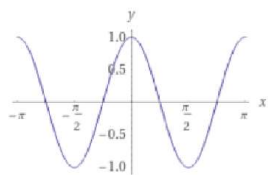
$$x=0$$

$$y=0$$

$$x = \frac{n\pi}{2}$$

$$x = \frac{n\pi}{2}$$

$$x = \frac{n\pi}{2}$$



3.a) $f(x,y) = x^2 + y^2$

$$\frac{\partial^2 f}{\partial x^2} = 2$$

$$\frac{\partial^2 f}{\partial y^2} = 2$$

$$\frac{\partial^2 f}{\partial x \partial y} = 0$$

$$\begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix}$$

$$\lambda_1 = 2$$

$$\lambda_2 = 2$$