Note:- When the domain of a function is unspecified, it is conventionally considered to be the largest subset of $\mathbb{R}$ or $\mathbb{R}^2$ or $\mathbb{R}^3$ for which the function is defined.

1. Given a vector $A = [1, 4, -9, 7, 9, 4]$, write a MATLAB code to create a matrix B with two rows. The first row should contain the elements of A in descending order, and the second row should contain the corresponding original indices of the elements in A.

2. Let $f(x, y) = x^2 + y^2$ and $g(x, y) = x\cos(y)$. Define $h(x, y)$ as the maximum of $f(x, y)$ and $g(x, y)$. Calculate the directional derivative of h at the points $(0, 0)$, $(0, 0.5)$, and $(1, 3)$ in the direction of the vector $(1, -2)$.

3. Check whether the given function is convex or not.

   a. $f_1(x) = x^2$ (using epigraph)

   b. $f_2(x, y) = e^x + y^2$ (using second ordered sufficient condition)

   c. $f_3(x, y) = \sin x + \cos y$

   d. $f_4(x, y) = x^3 + y^3$

   e. $f_5(x, y) = x^3 + y^3$, $(x, y) \in [4, 7] \times [4, 7]$.