A. Implement Newton-Raphson method to find a root of any differentiable single variable function provided with its first derivative. Function prototype is as follows:

```
double NewtonRaphson(double (*)(double), double (*)(double), double, double);
```

- Solve for roots of the following functions using your implementation:

  a. $f(x) = \exp(x) - x^2$

  b. $f(x) = -2x - \ln(x)$

  c. $f(x) = \cos^2 x + x$

B. Use finite difference method to calculate the Hessian matrix for any function of 2 double variables For a function $f(x, y)$, its Hessian matrix is

$$\begin{bmatrix} \frac{\partial^2 f}{\partial x^2} & \frac{\partial^2 f}{\partial x \partial y} \\ \frac{\partial^2 f}{\partial x \partial y} & \frac{\partial^2 f}{\partial y^2} \end{bmatrix}$$

Finite difference approximation for derivatives:

- $\frac{\partial^2 f}{\partial x^2} = \frac{f(x+\delta,y)+f(x-\delta,y)-2f(x,y)}{\delta^2}$
- $\frac{\partial^2 f}{\partial y^2} = \frac{f(x,y+\delta)+f(x,y-\delta)-2f(x,y)}{\delta^2}$
- $\frac{\partial^2 f}{\partial x \partial y} = \frac{f(x+\delta,y+\delta)+f(x-\delta,y-\delta)-f(x+\delta,y-\delta)-f(x-\delta,y+\delta)}{4\delta^2}$

Print out Hessian for

- $f_1(x, y) = x^2 + y^2 + 6x^2y^2$
- $f_2(x, y) = xy(x - y)$

at points $(0,0)$, $(1,1)$