Homework 6

1. $\begin{cases} f(x,y) = x^2 + y^2 - 4 = 0 \\ g(x,y) = e^x + y - 1 = 0 \end{cases}$

$$J(x,y) = \begin{bmatrix} 2x & 2y \\ e^x & 1 \end{bmatrix}$$

initial guess: $x_0 = 2$, $y_0 = -1$

Newton took 5 iterations and 8.2×10^{-5} seconds to find one of the roots.
Lazy Newton took 44 iterations and 0.0002 seconds to find the same root as Newton.
Broyden took 8 iterations and 0.0001 seconds to find the same root as Newton and Lazy Newton

2. $\begin{cases} x + \cos(xyz) - 1 = 0 \\ (1-x)^{1/4} + y + 0.05z^2 - 0.15z - 1 = 0 \\ -x^2 - 0.1y^2 + 0.001y + z - 1 = 0 \end{cases}$

$$J = \begin{bmatrix} 1 - yz\sin(xyz) & -xz\sin(xyz) & -xy\sin(xyz) \\ -1/4(1-x)^{-3/4} & 1 & 0.1z - 0.15 \\ -2x & -0.2y + 0.001 & 1 \end{bmatrix}$$