

## HOMework # 3

Use Newton's method to solve each of the following problems. Show the Jacobian explicitly, and indicate the entire sequence that leads to the solution (that is, specify  $x(1)$ ,  $x(2)$ , ... etc.). You can terminate the iterative process when all components of  $F(x)$  become  $< 10^{-4}$  in magnitude.

### PROBLEM 1

a) Solve

$$e^x - 2 \cos(x) + \tan(2x) = 0$$

with  $x(0) = 0$  as the initial guess.

b) Solve

$$x^3 + 3x^2 - 6x - 8 = 0$$

with  $x(0) = 0$  as the initial guess. Then find the other two roots.

c) Solve

$$[x - \sin(x)]^2 - 2 \log(x) = 0$$

with  $x(0) = 5$  as the initial guess.

## PROBLEM 2

Solve the system

$$3x_1 - 2x_2^2 - 5x_2 + 15 = 0$$

$$2x_1^2 - 3x_1 + x_2^2 + 2x_2 - 7 = 0$$

using  $x_1(0) = 1.5$ ,  $x_2(0) = 1.5$  as the initial guess.

## PROBLEM 3

Solve the system

$$x_1^2 + 2x_2 - x_3 + 6 = 0$$

$$x_1x_2 + x_3^2 - 7 = 0$$

$$x_1 + x_2^2 + x_3 - 8 = 0$$

using  $x_1(0) = -1$ ,  $x_2(0) = -1$ ,  $x_3(0) = -1$  as the initial guess.

## PROBLEM 4

Find *at least two* solutions for the system

$$\tan(x_1 + x_2) + x_1x_2 - 1 = 0$$

$$x_1^2 + x_2^2 - 2x_1x_2\cos(x_1) - 2 = 0$$

Choose your own initial conditions.