6. Nonlinear System

6.1 Exercises

Exercises: Newton–Raphson's Method

Exercise 6.1 A system of two equations describing the intersection of a circle and an ellipse are given as follows

$$(x-4)^2 + (y-1)^2 = 25$$
$$4(x-1)^2 + 16(y+3)^2 = 64$$

Find the points of intersection of this two curves using first iteration of Newton–Raphson method with initial estimates of $x(0) = 0.5$ and $y(0) = 0.5$. ∎

Exercise 6.2 Solve the system of two nonlinear equations

$$y - x^2 + 2 = 0$$
$$x^2 + (y-3)^2 - 9 = 0$$

using Newton–Raphson method with one iteration and an initial guess of $x_0 = 1.6$ and $y_0 = 7$. ∎

Exercise 6.3 Solve the system of nonlinear equations

$$0.5\exp(xy) + 3x^2 - y = -5$$
$$\sin(x) + \cos(y) = 5$$

using Newton–Raphson's method for FIRST iteration only. Given that the initial guesses, of $x = 1.5$ and $y = 0.5$. ∎

Exercise 6.4 Two cars are moving in an area A. Let the movement of car 1 and car 2 to be described by $f(x,y)$ and $g(x,y)$, respectively as

$$
\begin{aligned}
f(x,y) &= x^2 - y - 2 \\
g(x,y) &= x - y^2 + 1
\end{aligned}
$$

Find the meeting points of these two cars if $(x_0, y_0) = (2,2)$ by using Newton–Raphson's method.

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