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① $-\sin y$ Newton - Raphson
$\cos x$

$2x = \cos y$ $P_0(1, 0.5)$ 5 iteraciones
$2y = \sin x$

$\cos y - 2x = 0$ 5
$\sin x - 2y = 0$

1era iteración

①
$$f(P_n) = \begin{bmatrix} \cos y - 2x \\ \sin x - 2y \end{bmatrix} ; \quad f(1, 0.5) = \begin{bmatrix} -1.122417 \\ -0.158529 \end{bmatrix}$$

②
$$J(x, y) = \begin{bmatrix} -2 & -\sin y \\ \cos x & -2 \end{bmatrix}$$

$$J(1, 0.5) = \begin{bmatrix} -2 & -0.479426 \\ 0.540302 & -2 \end{bmatrix}$$

③
$$\begin{bmatrix} -2 & -0.479426 \\ 0.540302 & -2 \end{bmatrix} \begin{bmatrix} \Delta p \\ \Delta q \end{bmatrix} = \begin{bmatrix} 1.122417 \\ 0.158529 \end{bmatrix}, \text{ despejando } \Delta p$$

$$\Delta p = \begin{bmatrix} -2 & -0.479426 \\ 0.540302 & -2 \end{bmatrix}^{-1} \begin{bmatrix} 1.122417 \\ 0.158529 \end{bmatrix} = \begin{bmatrix} -0.509231 \\ -0.216834 \end{bmatrix}$$

④
$$P_1 = P_0 + \Delta p = \begin{bmatrix} 1 \\ 0.5 \end{bmatrix} + \begin{bmatrix} -0.509231 \\ -0.216834 \end{bmatrix} = \begin{bmatrix} 0.490769 \\ 0.283166 \end{bmatrix}$$

$p_1 = 0.490769$
$q_1 = 0.283166$

2da iteración

① $f(0.490769, 0.283166) = \begin{bmatrix} -0.021362 \\ -0.095028 \end{bmatrix}$

② $J(0.490769, 0.283166) = \begin{bmatrix} -2 & -0.279397 \\ 0.881971 & -2 \end{bmatrix}$

③ $\Delta p = \begin{bmatrix} -2 & -0.279397 \\ 0.881971 & -2 \end{bmatrix}^{-1} \begin{bmatrix} 0.021362 \\ 0.095028 \end{bmatrix} = \begin{bmatrix} -0.003809 \\ -0.049194 \end{bmatrix}$

④ $p_2 = p_1 + \Delta p = \begin{bmatrix} 0.490769 \\ 0.283166 \end{bmatrix} + \begin{bmatrix} -0.003809 \\ -0.049194 \end{bmatrix} = \begin{bmatrix} 0.48696 \\ 0.233972 \end{bmatrix}$

$p_2 = 0.48696$

$q_2 = 0.233972$

3era iteración

① $f(0.48696, 0.233972) = \begin{bmatrix} -0.001167 \\ -0.000003 \end{bmatrix}$

② $J(0.48696, 0.233972) = \begin{bmatrix} -2 & -0.231843 \\ 0.883759 & -2 \end{bmatrix}$

③ $\Delta p = \begin{bmatrix} -2 & -0.231843 \\ 0.883759 & -2 \end{bmatrix}^{-1} \begin{bmatrix} 0.001167 \\ 0.000003 \end{bmatrix} = \begin{bmatrix} -0.000555 \\ -0.000247 \end{bmatrix}$

④ $p_3 = p_2 + \Delta p = \begin{bmatrix} 0.48696 \\ 0.233972 \end{bmatrix} + \begin{bmatrix} -0.000555 \\ -0.000247 \end{bmatrix} = \begin{bmatrix} 0.486405 \\ 0.233725 \end{bmatrix}$

$p_3 = 0.486405$

$q_3 = 0.233725$

4to Iteración

①

$$f(0.486405, 0.233725) = \begin{bmatrix} 0.000000 \\ 0.000001 \end{bmatrix}$$ ← Se necesita más decimales (k7)

Ya no es posible

c.

Iteración	p	q	E_p	E_q
0	1	0.5	No hay error	No hay error
1	0.490769	0.283166	103.7619%	76.5749%
2	0.48696	0.233972	0.7822%	21.0256%
3	0.486405	0.233725	0.1141%	0.1057%

Las soluciones al sistema son:

$p_3 = 0.486405$ $\quad E_p = 0.1141\%$

$q_3 = 0.233725$ $\quad E_q = 0.1057\%$