TECNOLÓGICO DE ESTUDIOS SUPERIORES DE ECATEPEC

División de ingeniería en Sistemas Computacionales

"Tarea_4"

Alumno: Espíndola Alcántara Eduardo

Profesor: Pedro Fernando Flores Palmeros

Grupo: 5501

Ejercicio 1

f (x) = −0.5x2 +2.5x +4.5

PARA LA RAÍZ POSITIVA. Hacer el método de Bisección (5 iteraciones a mano) y verificar el método computacionalmente, mostrar la gráfica de convergencia.

Intervalo

0

-6

Criterio de paro: 0.0001

xl: 0.0 -> f(xl): 4.5

xr: -3.0 -> f(xr): -7.5

xu: -6.0 -> f(xu): -28.5

Nuevo intervalo: 0.0   -3.0

xl: 0.0 -> f(xl): 4.5

xr: -1.5 -> f(xr): -0.375

xu: -3.0 -> f(xu): -7.5

Nuevo intervalo: 0.0   -1.5

xl: 0.0 -> f(xl): 4.5

xr: -0.75 -> f(xr): 2.34375

xu: -1.5 -> f(xu): -0.375

Nuevo intervalo: -0.75   -1.5

xl: -0.75 -> f(xl): 2.34375

xr: -1.125 -> f(xr): 1.0546875

xu: -1.5 -> f(xu): -0.375

Nuevo intervalo: -1.125   -1.5

xl: -1.125 -> f(xl): 1.0546875

xr: -1.3125 -> f(xr): 0.357421875

xu: -1.5 -> f(xu): -0.375

Nuevo intervalo: -1.3125   -1.5

xl: -1.3125 -> f(xl): 0.357421875

xr: -1.40625 -> f(xr): -0.00439453125

xu: -1.5 -> f(xu): -0.375

Nuevo intervalo: -1.3125   -1.40625

xl: -1.3125 -> f(xl): 0.357421875

xr: -1.359375 -> f(xr): 0.1776123046875

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.359375   -1.40625

xl: -1.359375 -> f(xl): 0.1776123046875

xr: -1.3828125 -> f(xr): 0.086883544921875

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.3828125   -1.40625

xl: -1.3828125 -> f(xl): 0.086883544921875

xr: -1.39453125 -> f(xr): 0.04131317138671875

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.39453125   -1.40625

xl: -1.39453125 -> f(xl): 0.04131317138671875

xr: -1.400390625 -> f(xr): 0.018476486206054688

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.400390625   -1.40625

xl: -1.400390625 -> f(xl): 0.018476486206054688

xr: -1.4033203125 -> f(xr): 0.007045269012451172

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.4033203125   -1.40625

xl: -1.4033203125 -> f(xl): 0.007045269012451172

xr: -1.40478515625 -> f(xr): 0.001326441764831543

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.40478515625   -1.40625

xl: -1.40478515625 -> f(xl): 0.001326441764831543

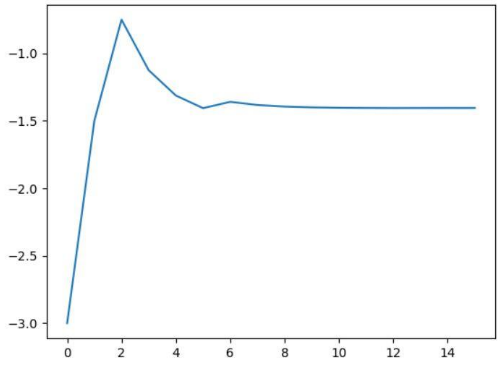
xr: -1.405517578125 -> f(xr): -0.0015337765216827393

xu: -1.40625 -> f(xu): -0.00439453125

Nuevo intervalo: -1.40478515625   -1.405517578125

xl: -1.40478515625 -> f(xl): 0.001326441764831543

xr: -1.4051513671875 -> f(xr): -0.00010360032320022583 xu: -1.405517578125 -> f(xu): -0.0015337765216827393



Nuevo intervalo: -1.40478515625   -1.4051513671875

xl: -1.40478515625 -> f(xl): 0.001326441764831543

xr: -1.40496826171875 -> f(xr): 0.0006114374846220016

xu: -1.4051513671875 -> f(xu): -0.00010360032320022583

Nuevo intervalo: -1.40496826171875   -1.4051513671875

xl: -1.40496826171875 -> f(xl): 0.0006114374846220016

xr: -1.405059814453125 -> f(xr): 0.0002539227716624737

xu: -1.4051513671875 -> f(xu): -0.00010360032320022583

Nuevo intervalo: -1.405059814453125   -1.4051513671875

Criterio de paro: 0.0001

Error aceptado: 6.515931452401121e-05

PARA LA RAÍZ NEGATIVA. Hacer el método de Falsa posición (5 iteraciones a mano) y verificar el método computacionalmente, mostrar la gráfica de convergencia.

Intervalo

0

7

Criterio de paro: 0.0001

xl: 0.0 -> f(xl): 4.5

xr: 3.5 -> f(xr): 7.125

xu: 7.0 -> f(xu): -2.5

Nuevo intervalo: 3.5   7.0

xl: 3.5 -> f(xl): 7.125

xr: 5.25 -> f(xr): 3.84375

xu: 7.0 -> f(xu): -2.5

Nuevo intervalo: 5.25   7.0

xl: 5.25 -> f(xl): 3.84375

xr: 6.125 -> f(xr): 1.0546875

xu: 7.0 -> f(xu): -2.5

Nuevo intervalo: 6.125   7.0

xl: 6.125 -> f(xl): 1.0546875

xr: 6.5625 -> f(xr): -0.626953125

xu: 7.0 -> f(xu): -2.5

Nuevo intervalo: 6.125   6.5625

xl: 6.125 -> f(xl): 1.0546875

xr: 6.34375 -> f(xr): 0.23779296875

xu: 6.5625 -> f(xu): -0.626953125

Nuevo intervalo: 6.34375   6.5625

xl: 6.34375 -> f(xl): 0.23779296875

xr: 6.453125 -> f(xr): -0.1885986328125

xu: 6.5625 -> f(xu): -0.626953125

Nuevo intervalo: 6.34375   6.453125

xl: 6.34375 -> f(xl): 0.23779296875

xr: 6.3984375 -> f(xr): 0.026092529296875

xu: 6.453125 -> f(xu): -0.1885986328125

Nuevo intervalo: 6.3984375   6.453125

xl: 6.3984375 -> f(xl): 0.026092529296875

xr: 6.42578125 -> f(xr): -0.08087921142578125

xu: 6.453125 -> f(xu): -0.1885986328125

Nuevo intervalo: 6.3984375   6.42578125

xl: 6.3984375 -> f(xl): 0.026092529296875

xr: 6.412109375 -> f(xr): -0.027299880981445312

xu: 6.42578125 -> f(xu): -0.08087921142578125

Nuevo intervalo: 6.3984375   6.412109375

xl: 6.3984375 -> f(xl): 0.026092529296875

xr: 6.4052734375 -> f(xr): -0.0005803108215332031

xu: 6.412109375 -> f(xu): -0.027299880981445312

Nuevo intervalo: 6.3984375   6.4052734375

xl: 6.3984375 -> f(xl): 0.026092529296875

xr: 6.40185546875 -> f(xr): 0.012761950492858887 xu: 6.4052734375 -> f(xu): -0.0005803108215332031

Nuevo intervalo: 6.40185546875   6.4052734375

xl: 6.40185546875 -> f(xl): 0.012761950492858887

xr: 6.403564453125 -> f(xr): 0.006092280149459839

xu: 6.4052734375 -> f(xu): -0.0005803108215332031

Nuevo intervalo: 6.403564453125   6.4052734375

xl: 6.403564453125 -> f(xl): 0.006092280149459839

xr: 6.4044189453125 -> f(xr): 0.002756349742412567

xu: 6.4052734375 -> f(xu): -0.0005803108215332031

Nuevo intervalo: 6.4044189453125   6.4052734375

xl: 6.4044189453125 -> f(xl): 0.002756349742412567

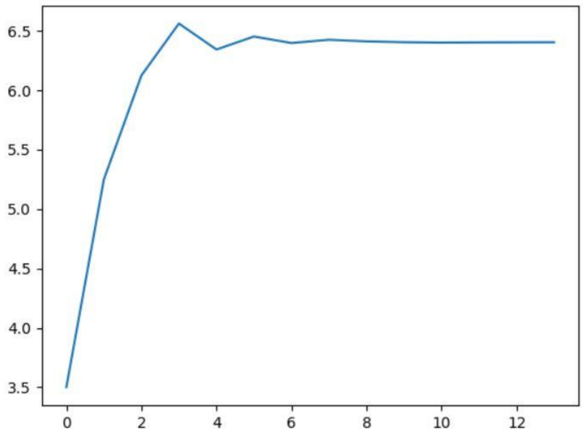
xr: 6.40484619140625 -> f(xr): 0.0010881107300519943

xu: 6.4052734375 -> f(xu): -0.0005803108215332031

Nuevo intervalo: 6.40484619140625   6.4052734375

Criterio de paro: 0.0001

Error aceptado: 6.670669068107532e-05



Ejercicio 2

f (x) = 5x3 −5x2 +6x −2

Utilizando el método de bisección localice la raíz en el intervalo x ∈ [0,1]

Criterio de paro: 0.0001

xl: 0.0 -> f(xl): -2.0

xr: 0.5 -> f(xr): 0.375

xu: 1.0 -> f(xu): 4.0

Nuevo intervalo: 0.0   0.5

xl: 0.0 -> f(xl): -2.0

xr: 0.25 -> f(xr): -0.734375

xu: 0.5 -> f(xu): 0.375

Nuevo intervalo: 0.25   0.5

xl: 0.25 -> f(xl): -0.734375

xr: 0.375 -> f(xr): -0.189453125

xu: 0.5 -> f(xu): 0.375

Nuevo intervalo: 0.375   0.5

xl: 0.375 -> f(xl): -0.189453125

xr: 0.4375 -> f(xr): 0.086669921875

xu: 0.5 -> f(xu): 0.375

Nuevo intervalo: 0.375   0.4375

xl: 0.375 -> f(xl): -0.189453125

xr: 0.40625 -> f(xr): -0.052459716796875

xu: 0.4375 -> f(xu): 0.086669921875

Nuevo intervalo: 0.40625   0.4375

xl: 0.40625 -> f(xl): -0.052459716796875

xr: 0.421875 -> f(xr): 0.016780853271484375

xu: 0.4375 -> f(xu): 0.086669921875

Nuevo intervalo: 0.40625   0.421875

xl: 0.40625 -> f(xl): -0.052459716796875

xr: 0.4140625 -> f(xr): -0.017913341522216797

xu: 0.421875 -> f(xu): 0.016780853271484375

Nuevo intervalo: 0.4140625   0.421875

xl: 0.4140625 -> f(xl): -0.017913341522216797

xr: 0.41796875 -> f(xr): -0.0005856156349182129

xu: 0.421875 -> f(xu): 0.016780853271484375

Nuevo intervalo: 0.41796875   0.421875

xl: 0.41796875 -> f(xl): -0.0005856156349182129

xr: 0.419921875 -> f(xr): 0.008092664182186127

xu: 0.421875 -> f(xu): 0.016780853271484375

Nuevo intervalo: 0.41796875   0.419921875

xl: 0.41796875 -> f(xl): -0.0005856156349182129

xr: 0.4189453125 -> f(xr): 0.0037522995844483376

xu: 0.419921875 -> f(xu): 0.008092664182186127

Nuevo intervalo: 0.41796875   0.4189453125

xl: 0.41796875 -> f(xl): -0.0005856156349182129 xr: 0.41845703125 -> f(xr): 0.001583037548698485

xu: 0.4189453125 -> f(xu): 0.0037522995844483376

Nuevo intervalo: 0.41796875   0.41845703125

xl: 0.41796875 -> f(xl): -0.0005856156349182129

xr: 0.418212890625 -> f(xr): 0.0004986350686522201

xu: 0.41845703125 -> f(xu): 0.001583037548698485

Nuevo intervalo: 0.41796875   0.418212890625

xl: 0.41796875 -> f(xl): -0.0005856156349182129

xr: 0.4180908203125 -> f(xr): -4.350922790763434e-05

xu: 0.418212890625 -> f(xu): 0.0004986350686522201

Nuevo intervalo: 0.4180908203125   0.418212890625

xl: 0.4180908203125 -> f(xl): -4.350922790763434e-05

xr: 0.41815185546875 -> f(xr): 0.00022755818076802825

xu: 0.418212890625 -> f(xu): 0.0004986350686522201

Nuevo intervalo: 0.4180908203125   0.41815185546875

xl: 0.4180908203125 -> f(xl): -4.350922790763434e-05

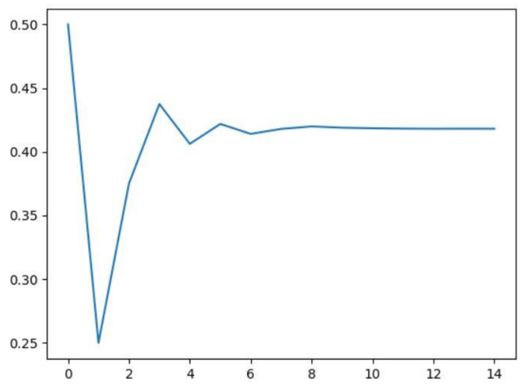
xr: 0.418121337890625 -> f(xr): 9.202329195545644e-05

xu: 0.41815185546875 -> f(xu): 0.00022755818076802825

Nuevo intervalo: 0.4180908203125   0.418121337890625

Criterio de paro: 0.0001

Error aceptado: 7.298737318443909e-05



Tarea 4

$f(x) = -0.5x^2 + 2.5x + 4.5$

· Determinar las raices reales utilizando la fórmula general de segundo grado

$$x_{1,2} = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$x_{1,2} = \frac{-2.5 \pm \sqrt{(2.5)^2 - 4(-0.5)(4.5)}}{2(-0.5)}$$

$x_1 = -1.405124$

$x_2 = 6.405124$

· Para la raiz positiva hacer el método de bisección (5 iteraciones a mano) y verificar el metodo computacionalmente y mostrar la grafica de convergencia

$f(x) = -0.5x^2 + 2.5x + 4.5$

intervalo -> $[0, -6]$ Criterio de paro -> 0.0001

$xl = 0$ $f(xl) = -0.5(0)^2 + 2.5(0) + 4.5$ -> $f(xl) = 4.5$

$xu = -6$ $f(xu) = -0.5(-6)^2 + 2.5(-6) + 4.5$ -> $f(xu) = -28.5$

$xr = \frac{-6+0}{2} = -3$ $f(xr) = -0.5(-3)^2 + 2.5(-3) + 4.5$ -> $f(xr) = -7.5$

Nuevo intervalo $[0, -3]$

$xl = 0$ $f(xl) = 4.5$

$xr = \frac{-3+0}{2} = -1.5$ $f(xr) = -0.5(-1.5)^2 + 2.5(-1.5) + 4.5$ -> -0.375

$xu = -3$ $f(xl) = -7.5$

Nuevo intervalo $[0, -1.5]$

$xl = 0$ $\quad f(xl) = 4.5$

$xr = \frac{-1.5 + 0}{2} = -0.75 \quad f(xr) = -0.5(-.75)^2 + 2.5(-.75) + 4.5 \rightarrow 2.34375$

$xu = -1.5$ $\quad f(xu) = -0.375$

Nuevo Intervalo $[-.75, -1.5]$

$xl = -0.75$ $\quad f(xl) = 2.34375$

$xr = \frac{-1.5 + (-0.75)}{2} = -1.125 \quad f(xr) = 1.05468$

$xu = -1.5$ $\quad f(xu) = -0.375$

Nuevo intervalo $[-1.125, -1.5]$

$xl = -1.125$ $\quad f(xl) = 1.05468$

$xr = \frac{-1.5 - 1.125}{2} = -1.3125 \quad f(xr) = 0.35742$

$xu = -1.5$ $\quad f(xu) = -0.375$

- Para la raiz negativa hacer el metodo de falsa posición

$f(x) = -0.5x^2 + 2.5x + 4.5$ $\quad$ intervalo $[0, 7]$

$xl = 0$ $\quad f(xl) = 4.5$

$xr = xu - \frac{f(xu)(xl - xu)}{f(xl) - f(xu)} \quad f(xr) = 5.265$

$xr = 4.5$

$xu = 7$ $\quad f(xu) = -2.5$

Nuevo intervalo [4.5 , 7]

$xl = 4.5$ $\quad f(xl) = 5.625$

$xr = xu - \frac{f(xu)(xl - xu)}{f(xl) - f(xu)}$ $\quad f(xr) = 0.6656$

$xr = 6.2307$

$xu = 7$ $\quad f(xu) = -2.5$

Nuevo Intervalo [6.2307, 7]

$xl = 6.2307$ $\quad f(xl) = 0.6656$

$xr = xu - \frac{f(xu)(xl - xu)}{f(xl) - f(xu)}$ $\quad f(xr) = 0.0491$

$xr = 6.3925$

$xu = 7$ $\quad f(xu) = -2.5$

Nuevo intervalo [6.3925, 7]

$xl = 6.3925$ $\quad f(xl) = 0.0491$

$xr = xu - \frac{f(xu)(xl - xu)}{f(xl) - f(xu)}$ $\quad f(xr) = 0.0034$

$xr = 6.4042$

$xu = 7$ $\quad f(xu) = -2.5$

Nuevo intervalo [6.4042, 7]

$xl = 6.4042$ $\quad f(xl) = 0.0034$

$xr = xu - \frac{f(xu(xl - xu)}{f(xl) - f(xu)}$ $\quad f(xr) = 0.0002$

$xr = 6.4050$

$xu = 7$ $\quad f(xu) = -2.5$

2) $f(x) = 5x^3 - 5x^2 + 6x - 2$

· Determinar las raices reales utilizando la formula general de segundo grado

No se puede resolver con el metodo de la formula general de 2do grado

· Utilizando el metodo biseccion localice la raiz en el intervalo $x \in [0, 1]$

$xl = 0$ $\quad f(xl) = -2$

$xr = \frac{1 + 0}{2}$ $\quad f(xr) = 0.375$

$xr = 0.5$

$xu = 1$ $\quad f(xu) = 40$

Nuevo intervalo $[0, 0.5]$

$xl = 0$ $\quad f(xl) = -2$

$xr = 0.25$ $\quad f(xr) = -0.7343$

$xu = 0.5$ $\quad f(xu) = 0.375$

Nuevo Intervalo $[0.25, 0.5]$

$xl = 0.25$ $\quad f(xl) = -0.7343$

$xr = 0.375$ $\quad f(xr) = -0.1894$

$xu = 0.5$ $\quad f(xu) = 0.375$

Nuevo Intervalo $[0.375, 0.5]$

$xl = 0.375$ $\quad f(xl) = -0.1894$

$xr = 0.4375$ $\quad f(xr) = 0.0866$

$xu = 0.5$ $\quad f(xu) = 0.375$

Ejercicio 3

$f(x) = \ln(x^2)$

· Determinar las 3 primeras iteraciones utilizando Bisección intervalo [0.5, 2]

$xl = 0.5$ $f(xl) = -1.3862$

$xr = 1.25$ $f(xr) = 0.4462$

$xu = 2$ $f(xu) = 1.3862$

Nuevo Intervalo [0.5, 1.25]

$xl = 0.5$ $f(xl) = -1.3866$

$xr = 0.875$ $f(xr) = -0.2670$

$xu = 1.25$ $f(xu) = 0.4462$

Nuevo Intervalo [0.875, 1.25]

$xl = 0.875$ $f(xl) = -0.2670$

$xr = 1.0625$ $f(xr) = 0.1212$

$xu = 1.25$ $f(xu) = 0.4462$

· Determinar las 3 primeras iteraciones utilizando falsa posición. Intervalo [0.5, 2]

$xl = 0.5$ $f(xl) = -1.3862$

$xr = 1.25$ $f(xr) = 0.4462$

$xu = 2$ $f(xu) = 1.3862$

Nuevo Intervalo [0.5, 1.25]

$xl = 0.5$ $f(xl) = -1.3862$

$xr = 1.0673$ $f(xr) = 0.1303$

$xu = 1.25$ $f(xu) = 0.4462$

Nuevo Intervalo $[0.5, 1.0673]$

$xl = 0.5$ $\quad f(xl) = -1.3862$

$xr = 1.0185$ $\quad f(xr) = 0.0368$

$xu = 1.0673$ $\quad f(xu) = 0.1303$

Ejercicio 4

$x^{3.5} = 80$

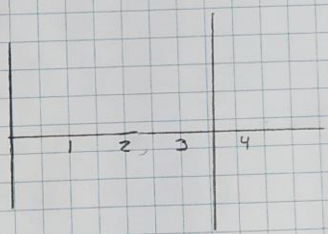
Determine la raíz bajo los sig. casos

· De forma analítica

$x^{3.5} = 80 \rightarrow x^{3\frac{1}{2}} = 80 \rightarrow x^{7/2} = 80 \quad x = 80^{2/7}$

$x = 3.4973$

· De forma gráfica



· Utilizando bisección 3 iteraciones a mano $[1,3]$

$f(x) = x^{3.5} - 80$

$f(xl) = (1)^{3.5} - 80 = -79$

$f(xu) = (3)^{3.5} - 80 = -33$

No se puede resolver en ese intervalo

· Utilizando falsa posición 3 iteraciones a mano

$f(xl) = -79$

$f(xu) = -33$

No se puede resolver en ese intervalo