PARCIAL ANÁLISIS NUMÉRICO

JOHANNA LIZETH BOLÍVAR CALDERÓN

27/08/2021

Punto 3 a

Teorema del punto fijo:

Sea g : [a, b] → R una función derivable que cumpla con:

• g([a, b]) ⊆ (a, b),

• max $_{x \in [a,b]}$

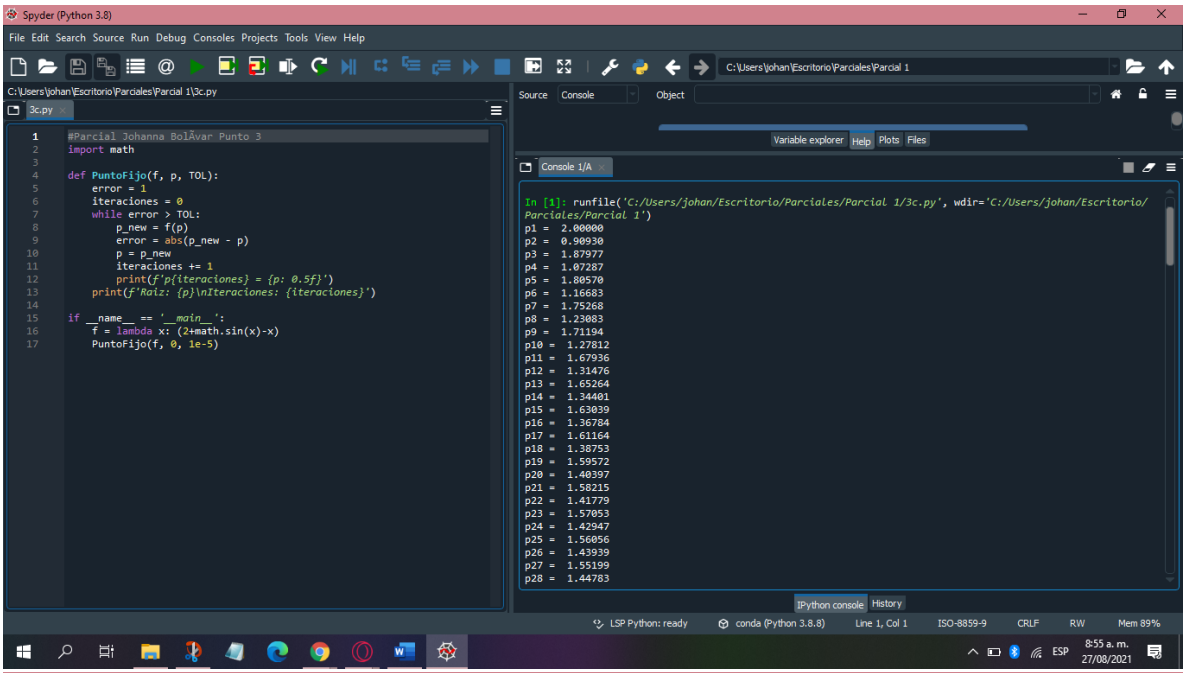
Entonces existe un único s ∈ [a, b] tal que g(s) = s

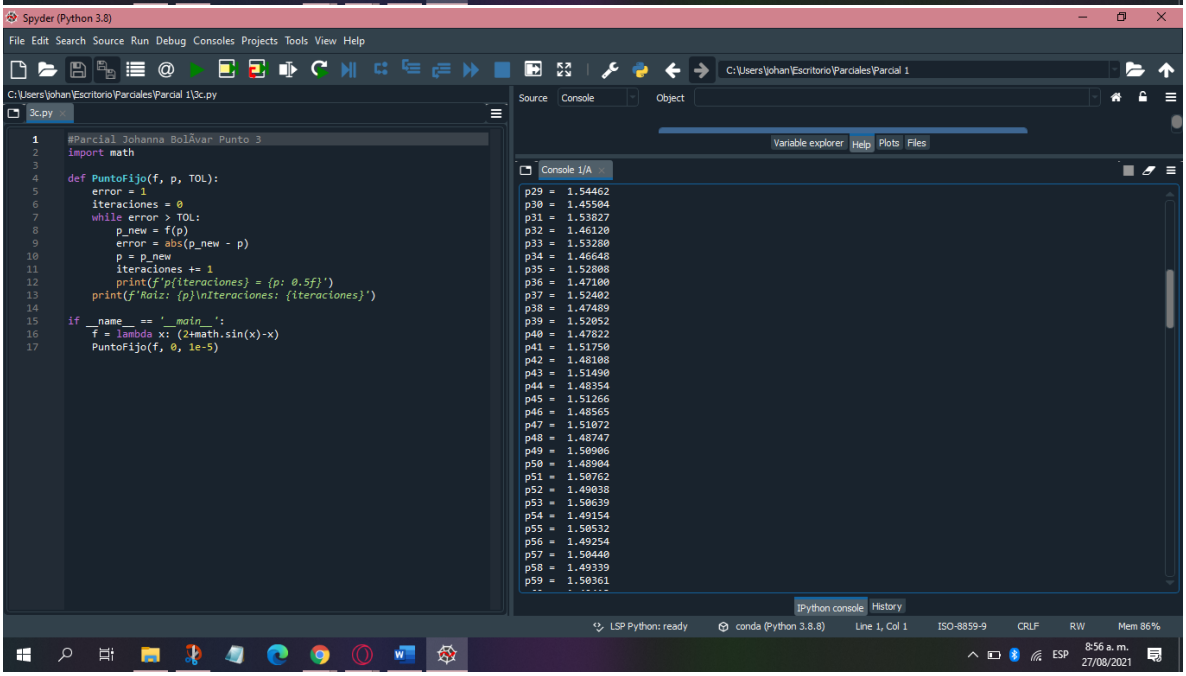
Para todo $x_0 \in [a, b]$, la sucesión $\{x_n\}$ generada por la iteración $x_{n+1} = g(x_n)$ con verge a s

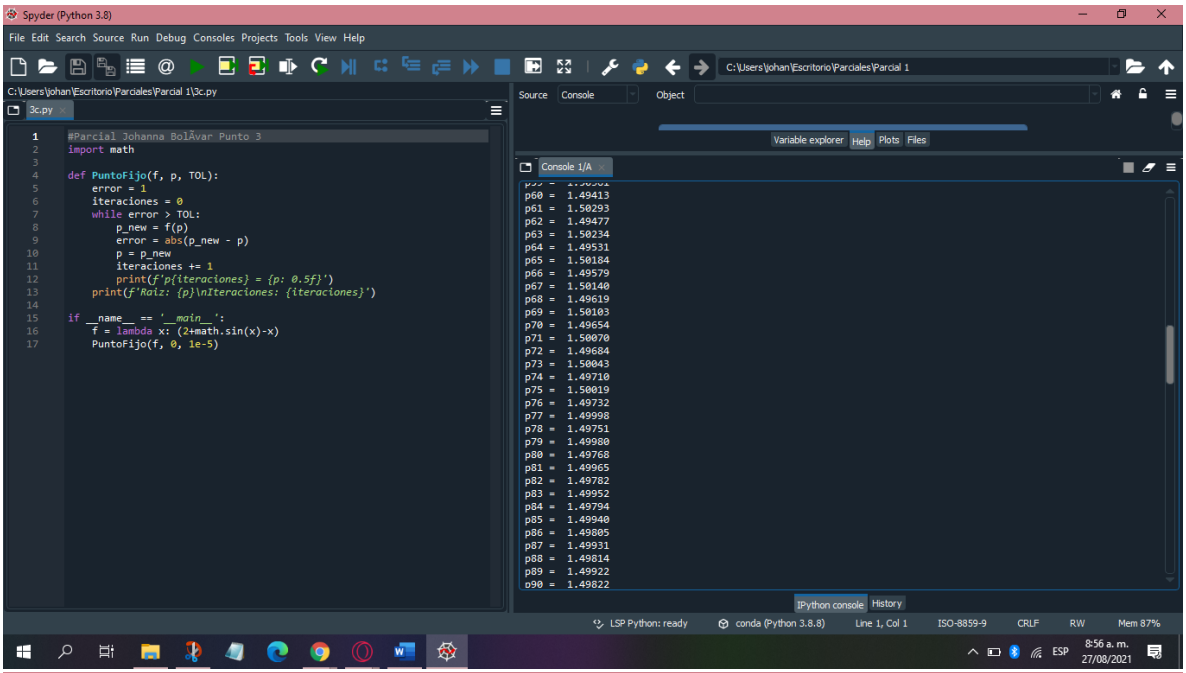
Código

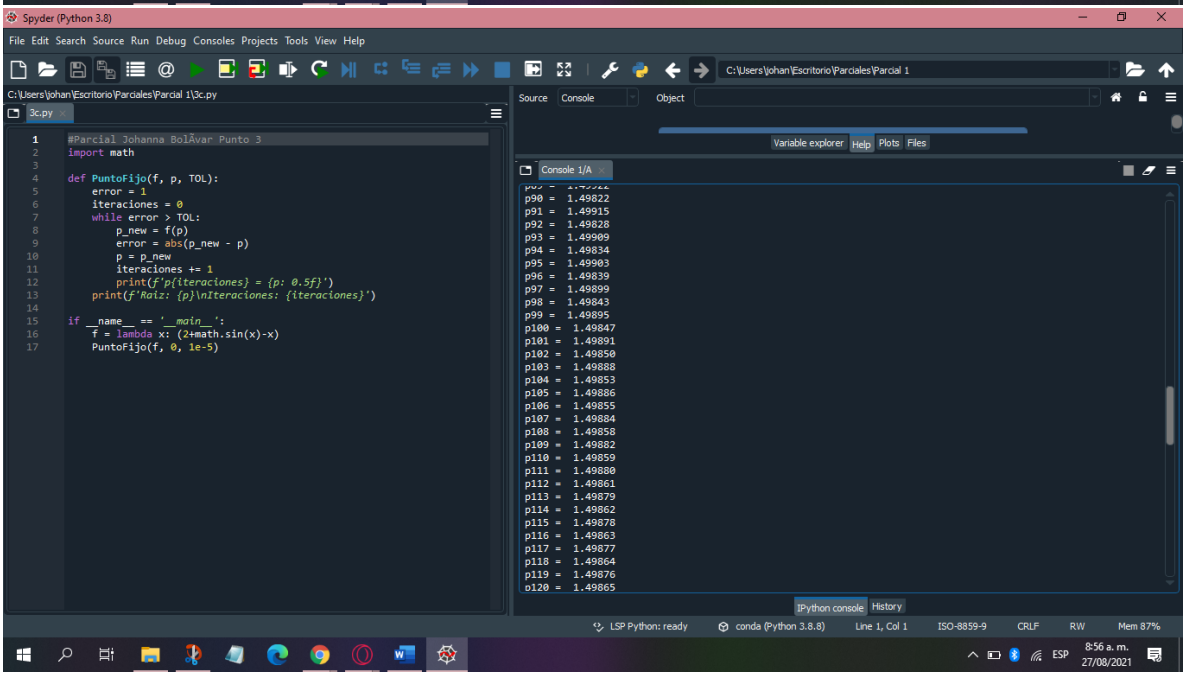
```python
#Parcial Johanna Bolívar Punto 3
import math

def PuntoFijo(f, p, TOL):
    error = 1
    iteraciones = 0
    while error > TOL:
        p_new = f(p)
        error = abs(p_new - p)
        p = p_new
        iteraciones += 1
        print(f'p{iteraciones} = {p: 0.5f}')
    print(f'Raiz: {p}\nIteraciones: {iteraciones}')

if __name__ == '__main__':
    f = lambda x: (2+math.sin(x)-x)
    PuntoFijo(f, 0, 1e-5)
```

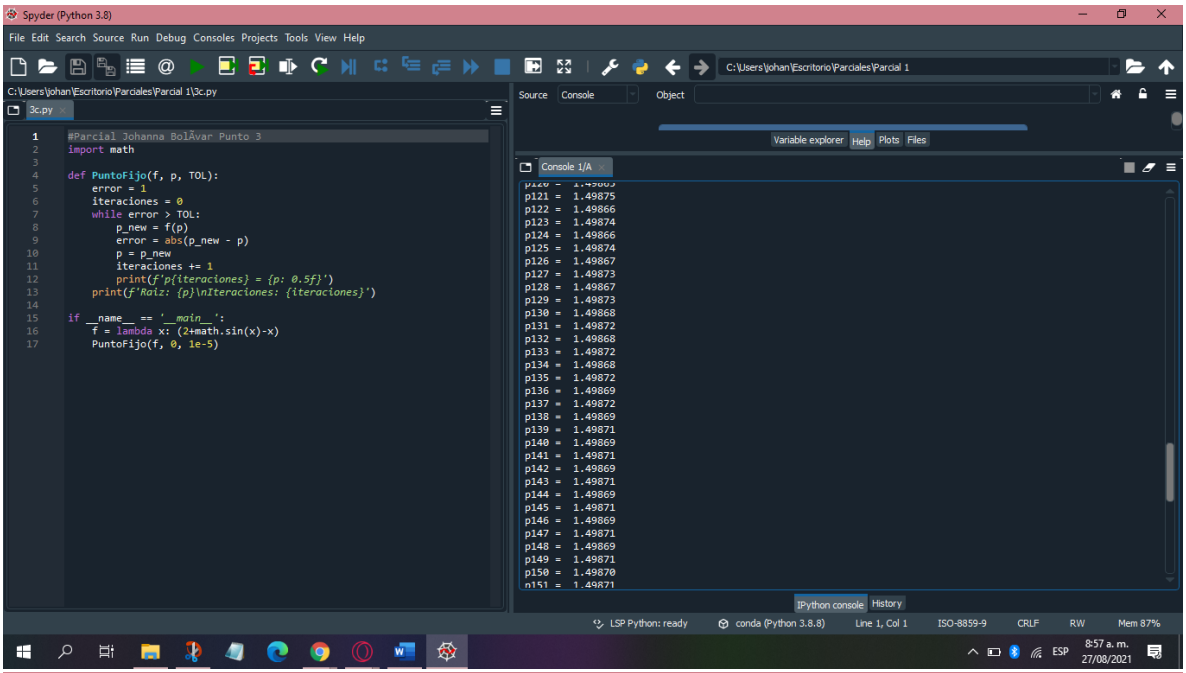
Resultados


Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\johan\Escritorio\Parciales\Parcial 1\3c.py
3c.py
#Parcial Johanna BolÃvar Punto 3
import math
def PuntoFijo(f, p, TOL):
error = 1
iteraciones = 0
while error > TOL:
p_new = f(p)
error = abs(p_new - p)
p = p_new
iteraciones += 1
print(f'p{iteraciones} = {p: 0.5f}')
print(f'Raiz: {p}\nIteraciones: {iteraciones}')
if __name__ == '__main__':
f = lambda x: (2+math.sin(x)-x)
PuntoFijo(f, 0, 1e-5)
Console 1/A
In [1]: runfile('C:/Users/johan/Escritorio/Parciales/Parcial 1/3c.py', wdir='C:/Users/johan/Escritorio/Parciales/Parcial 1')
p1 = 2.00000
p2 = 0.90930
p3 = 1.87977
p4 = 1.07287
p5 = 1.80570
p6 = 1.16683
p7 = 1.75268
p8 = 1.23083
p9 = 1.71194
p10 = 1.27812
p11 = 1.67936
p12 = 1.31476
p13 = 1.65264
p14 = 1.34401
p15 = 1.63039
p16 = 1.36784
p17 = 1.61164
p18 = 1.38753
p19 = 1.59572
p20 = 1.40397
p21 = 1.58215
p22 = 1.41779
p23 = 1.57053
p24 = 1.42947
p25 = 1.56056
p26 = 1.43939
p27 = 1.55199
p28 = 1.44783
IPython console
History
LSP Python: ready
conda (Python 3.8.8)
Line 1, Col 1
ISO-8859-9
CRLF
RW
Mem 89%
8:55 a. m.
27/08/2021


Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\johan\Escritorio\Parciales\Parcial 1\3c.py
3c.py
#Parcial Johanna BolÃvar Punto 3
import math
def PuntoFijo(f, p, TOL):
error = 1
iteraciones = 0
while error > TOL:
p_new = f(p)
error = abs(p_new - p)
p = p_new
iteraciones += 1
print(f'p{iteraciones} = {p: 0.5f}')
print(f'Raiz: {p}\nIteraciones: {iteraciones}')
if __name__ == '__main__':
f = lambda x: (2+math.sin(x)-x)
PuntoFijo(f, 0, 1e-5)
Console 1/A
p29 = 1.54462
p30 = 1.45504
p31 = 1.53827
p32 = 1.46120
p33 = 1.53280
p34 = 1.46648
p35 = 1.52808
p36 = 1.47100
p37 = 1.52402
p38 = 1.47489
p39 = 1.52052
p40 = 1.47822
p41 = 1.51750
p42 = 1.48108
p43 = 1.51490
p44 = 1.48354
p45 = 1.51266
p46 = 1.48565
p47 = 1.51072
p48 = 1.48747
p49 = 1.50906
p50 = 1.48904
p51 = 1.50762
p52 = 1.49038
p53 = 1.50639
p54 = 1.49154
p55 = 1.50532
p56 = 1.49254
p57 = 1.50440
p58 = 1.49339
p59 = 1.50361
IPython console
History
LSP Python: ready
conda (Python 3.8.8)
Line 1, Col 1
ISO-8859-9
CRLF
RW
Mem 86%
8:56 a. m.
27/08/2021


Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\johan\Escritorio\Parciales\Parcial 1\3c.py
3c.py
#Parcial Johanna BolÃvar Punto 3
import math
def PuntoFijo(f, p, TOL):
error = 1
iteraciones = 0
while error > TOL:
p_new = f(p)
error = abs(p_new - p)
p = p_new
iteraciones += 1
print(f'p{iteraciones} = {p: 0.5f}')
print(f'Raiz: {p}\nIteraciones: {iteraciones}')
if __name__ == '__main__':
f = lambda x: (2+math.sin(x)-x)
PuntoFijo(f, 0, 1e-5)
Console 1/A
p60 = 1.49413
p61 = 1.50293
p62 = 1.49477
p63 = 1.50234
p64 = 1.49531
p65 = 1.50184
p66 = 1.49579
p67 = 1.50140
p68 = 1.49619
p69 = 1.50103
p70 = 1.49654
p71 = 1.50070
p72 = 1.49684
p73 = 1.50043
p74 = 1.49710
p75 = 1.50019
p76 = 1.49732
p77 = 1.49998
p78 = 1.49751
p79 = 1.49980
p80 = 1.49768
p81 = 1.49965
p82 = 1.49782
p83 = 1.49952
p84 = 1.49794
p85 = 1.49940
p86 = 1.49805
p87 = 1.49931
p88 = 1.49814
p89 = 1.49922
p90 = 1.49822
IPython console
History
LSP Python: ready
conda (Python 3.8.8)
Line 1, Col 1
ISO-8859-9
CRLF
RW
Mem 87%
8:56 a. m.
27/08/2021


Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\johan\Escritorio\Parciales\Parcial 1\3c.py
3c.py
#Parcial Johanna BolÃvar Punto 3
import math
def PuntoFijo(f, p, TOL):
error = 1
iteraciones = 0
while error > TOL:
p_new = f(p)
error = abs(p_new - p)
p = p_new
iteraciones += 1
print(f'p{iteraciones} = {p: 0.5f}')
print(f'Raiz: {p}\nIteraciones: {iteraciones}')
if __name__ == '__main__':
f = lambda x: (2+math.sin(x)-x)
PuntoFijo(f, 0, 1e-5)
Console 1/A
p90 = 1.49822
p91 = 1.49915
p92 = 1.49828
p93 = 1.49909
p94 = 1.49834
p95 = 1.49903
p96 = 1.49839
p97 = 1.49899
p98 = 1.49843
p99 = 1.49895
p100 = 1.49847
p101 = 1.49891
p102 = 1.49850
p103 = 1.49888
p104 = 1.49853
p105 = 1.49886
p106 = 1.49855
p107 = 1.49884
p108 = 1.49858
p109 = 1.49882
p110 = 1.49859
p111 = 1.49880
p112 = 1.49861
p113 = 1.49879
p114 = 1.49862
p115 = 1.49878
p116 = 1.49863
p117 = 1.49877
p118 = 1.49864
p119 = 1.49876
p120 = 1.49865
IPython console
History
LSP Python: ready
conda (Python 3.8.8)
Line 1, Col 1
ISO-8859-9
CRLF
RW
Mem 87%
8:56 a. m.
27/08/2021


Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\johan\Escritorio\Parciales\Parcial 1\3c.py
3c.py
#Parcial Johanna BolÃvar Punto 3
import math
def PuntoFijo(f, p, TOL):
error = 1
iteraciones = 0
while error > TOL:
p_new = f(p)
error = abs(p_new - p)
p = p_new
iteraciones += 1
print(f'p{iteraciones} = {p: 0.5f}')
print(f'Raiz: {p}\nIteraciones: {iteraciones}')
if __name__ == '__main__':
f = lambda x: (2+math.sin(x)-x)
PuntoFijo(f, 0, 1e-5)
Console 1/A
p121 = 1.49875
p122 = 1.49866
p123 = 1.49874
p124 = 1.49866
p125 = 1.49874
p126 = 1.49867
p127 = 1.49873
p128 = 1.49867
p129 = 1.49873
p130 = 1.49868
p131 = 1.49872
p132 = 1.49868
p133 = 1.49872
p134 = 1.49868
p135 = 1.49872
p136 = 1.49869
p137 = 1.49872
p138 = 1.49869
p139 = 1.49871
p140 = 1.49869
p141 = 1.49871
p142 = 1.49869
p143 = 1.49871
p144 = 1.49869
p145 = 1.49871
p146 = 1.49869
p147 = 1.49871
p148 = 1.49869
p149 = 1.49871
p150 = 1.49870
p151 = 1.49871
Variable explorer Help Plots Files
IPython console History
LSP Python: ready
conda (Python 3.8.8)
Line 1, Col 1
ISO-8859-9
CRLF
RW
Mem 87%
8:57 a. m.
27/08/2021

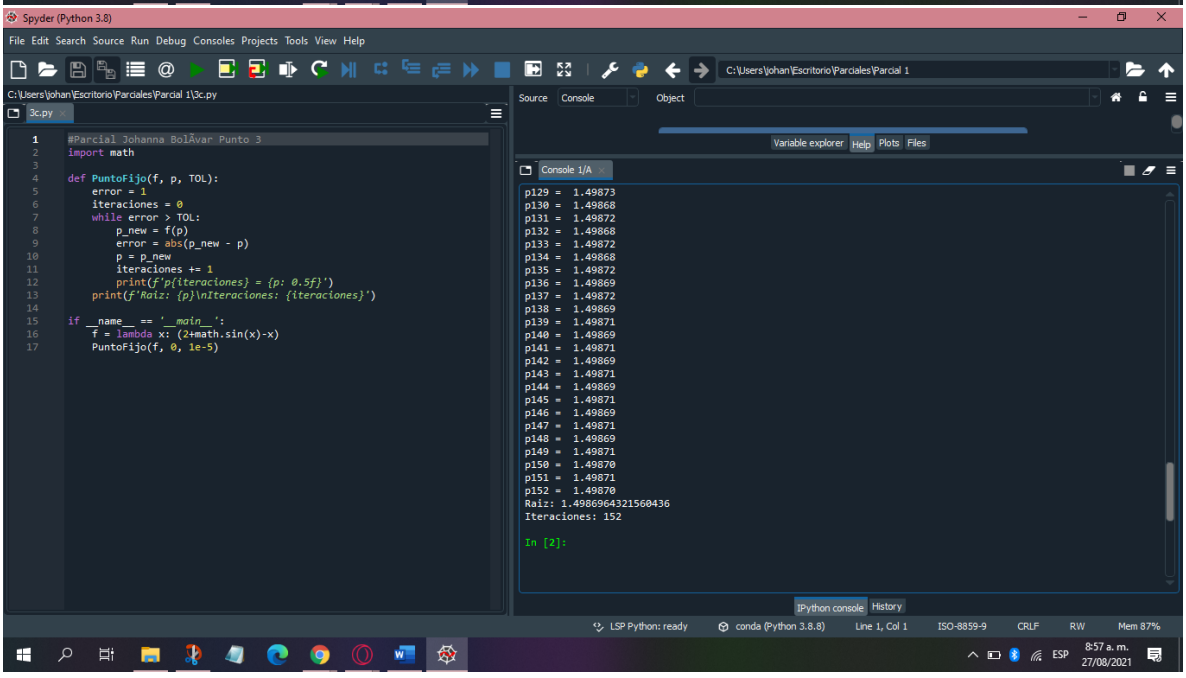
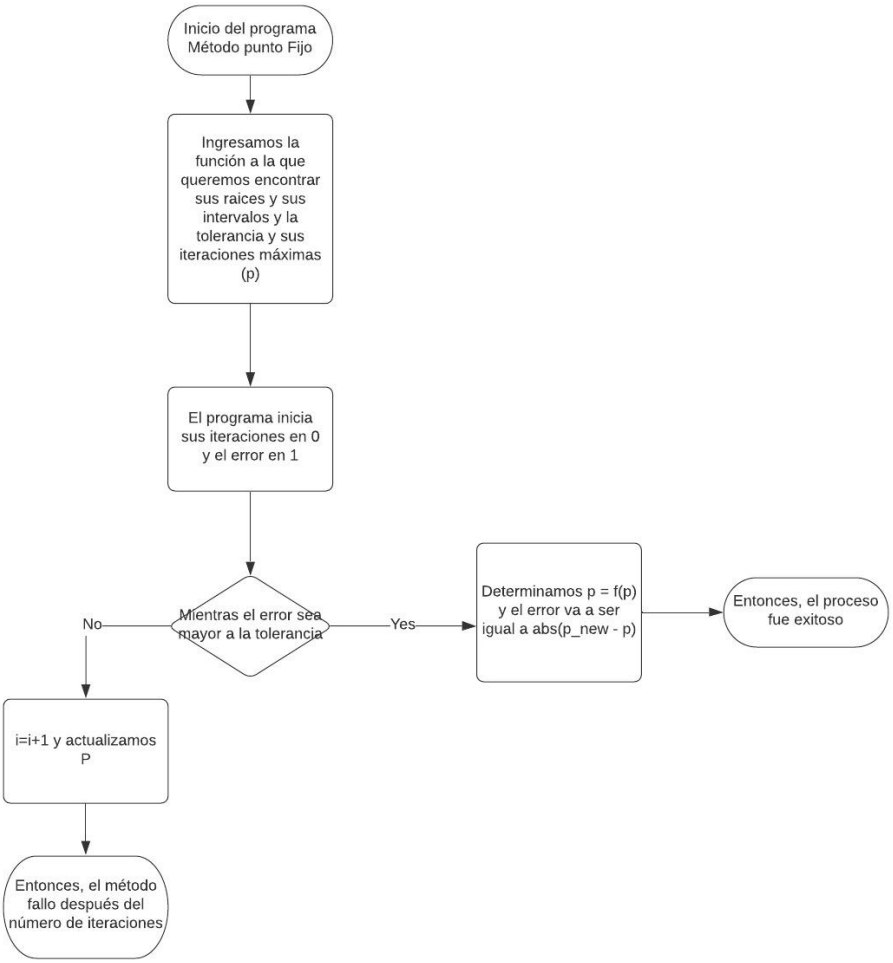

Spyder (Python 3.8)
File Edit Search Source Run Debug Consoles Projects Tools View Help
C:\Users\johan\Escritorio\Parciales\Parcial 1\3c.py
3c.py
#Parcial Johanna BolÃvar Punto 3
import math
def PuntoFijo(f, p, TOL):
error = 1
iteraciones = 0
while error > TOL:
p_new = f(p)
error = abs(p_new - p)
p = p_new
iteraciones += 1
print(f'p{iteraciones} = {p: 0.5f}')
print(f'Raiz: {p}\nIteraciones: {iteraciones}')
if __name__ == '__main__':
f = lambda x: (2+math.sin(x)-x)
PuntoFijo(f, 0, 1e-5)
Console 1/A
p129 = 1.49873
p130 = 1.49868
p131 = 1.49872
p132 = 1.49868
p133 = 1.49872
p134 = 1.49868
p135 = 1.49872
p136 = 1.49869
p137 = 1.49872
p138 = 1.49869
p139 = 1.49871
p140 = 1.49869
p141 = 1.49871
p142 = 1.49869
p143 = 1.49871
p144 = 1.49869
p145 = 1.49871
p146 = 1.49869
p147 = 1.49871
p148 = 1.49869
p149 = 1.49871
p150 = 1.49870
p151 = 1.49871
p152 = 1.49870
Raiz: 1.4986964321560436
Iteraciones: 152
In [2]:
Variable explorer Help Plots Files
IPython console History
LSP Python: ready
conda (Python 3.8.8)
Line 1, Col 1
ISO-8859-9
CRLF
RW
Mem 87%
8:57 a. m.
27/08/2021

Diagrama de flujo



Conclusión: El método de punto fijo converge con precisión y rapidez, no es necesario usar un intervalo para que funcione sino únicamente un punto perteneciente al intervalo donde esté la raíz. Algo negativo de usar el método es que no garantiza una convergencia.