Fernando Hernandez

1.

In [0]:
```

```

In [74]:
```
n(e^pi)*(5+2)
```

Out[74]:
```
161.984848429455
```

2.

In [63]:
```
x=var('x')
f = ((2*x^2-6*x-5)/(x-3))
show(f.derivative())
```

Out[63]:

In [61]:
```
solve(((2*(2*x-3))/x-3)-(2*x^2-6*x-5)/((x-3)^2)==0, x)
```

Out[61]:
```
[x == -1/2*(1/9*I*sqrt(43253)*sqrt(3) - 85)^(1/3)*(I*sqrt(3) + 1) - 31/3*(-I*sqr
t(3) + 1)/(1/9*I*sqrt(43253)*sqrt(3) - 85)^(1/3) - 2, x == -1/2*(1/9*I*sqrt(4325
3)*sqrt(3) - 85)^(1/3)*(-I*sqrt(3) + 1) - 31/3*(I*sqrt(3) + 1)/(1/9*I*sqrt(4325
3)*sqrt(3) - 85)^(1/3) - 2, x == (1/9*I*sqrt(43253)*sqrt(3) - 85)^(1/3) + 62/3/
(1/9*I*sqrt(43253)*sqrt(3) - 85)^(1/3) - 2]
```

In [97]:
```
#No max or min
```

In [83]:
```
solve((((2*x^2-6*x-5)/(x-3)))==0, x)
```

Out[83]:
```
[x == -1/2*sqrt(19) + 3/2, x == 1/2*sqrt(19) + 3/2]
```

x=0 @

In [98]:
```
x == -1/2*sqrt(19) + 3/2, x == 1/2*sqrt(19) + 3/2
```

y-intercept

In [100…
```
f(0)
```

Out[100…
```
1
```

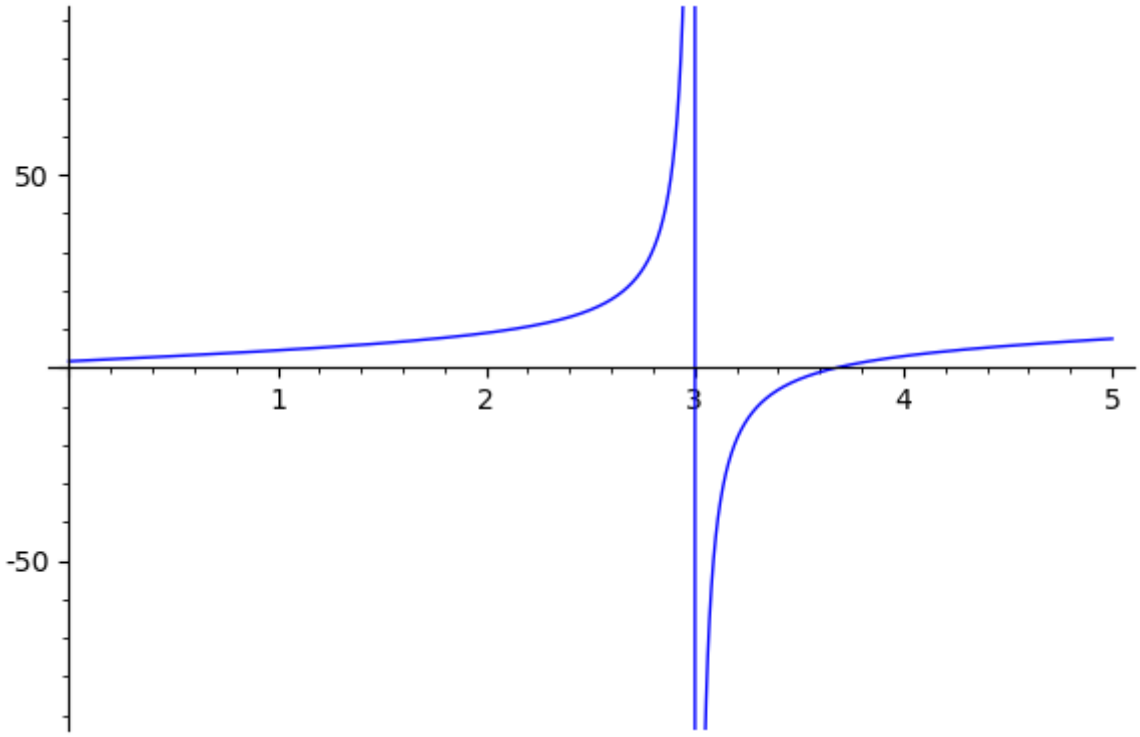
vertical asymtopes @

In [86]:
```
solve(1/f == 0, x)
```

Out[86]:
```
[x == 3]
```

In [73]:
```
plot((2*x^2-6*x-5)/(x-3), (0,5)).show(ymin=-90, ymax=90)
```

Out[73]:



3.

In [89]:
```
def f(x): return cos(x)*(e)^-x^2
a, b = 1,5
n = 100
```

In [92]:
```
print([i for i in range(n)])
print([i/2 + 1 for i in range(n)])
```

```
[0, 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 2
2, 23, 24, 25, 26, 27, 28, 29, 30, 31, 32, 33, 34, 35, 36, 37, 38, 39, 40, 41, 4
2, 43, 44, 45, 46, 47, 48, 49, 50, 51, 52, 53, 54, 55, 56, 57, 58, 59, 60, 61, 6
2, 63, 64, 65, 66, 67, 68, 69, 70, 71, 72, 73, 74, 75, 76, 77, 78, 79, 80, 81, 8
2, 83, 84, 85, 86, 87, 88, 89, 90, 91, 92, 93, 94, 95, 96, 97, 98, 99]
[1, 3/2, 2, 5/2, 3, 7/2, 4, 9/2, 5, 11/2, 6, 13/2, 7, 15/2, 8, 17/2, 9, 19/2, 1
0, 21/2, 11, 23/2, 12, 25/2, 13, 27/2, 14, 29/2, 15, 31/2, 16, 33/2, 17, 35/2, 1
8, 37/2, 19, 39/2, 20, 41/2, 21, 43/2, 22, 45/2, 23, 47/2, 24, 49/2, 25, 51/2, 2
6, 53/2, 27, 55/2, 28, 57/2, 29, 59/2, 30, 61/2, 31, 63/2, 32, 65/2, 33, 67/2, 3
4, 69/2, 35, 71/2, 36, 73/2, 37, 75/2, 38, 77/2, 39, 79/2, 40, 81/2, 41, 83/2, 4
2, 85/2, 43, 87/2, 44, 89/2, 45, 91/2, 46, 93/2, 47, 95/2, 48, 97/2, 49, 99/2, 5
0, 101/2]
```

In [93]:
```
x_n = [a + (b-a)/n*i for i in range(n+1)]
print(x_n)
```

```
[1, 26/25, 27/25, 28/25, 29/25, 6/5, 31/25, 32/25, 33/25, 34/25, 7/5, 36/25, 37/
25, 38/25, 39/25, 8/5, 41/25, 42/25, 43/25, 44/25, 9/5, 46/25, 47/25, 48/25, 49/
25, 2, 51/25, 52/25, 53/25, 54/25, 11/5, 56/25, 57/25, 58/25, 59/25, 12/5, 61/2
5, 62/25, 63/25, 64/25, 13/5, 66/25, 67/25, 68/25, 69/25, 14/5, 71/25, 72/25, 7
3/25, 74/25, 3, 76/25, 77/25, 78/25, 79/25, 16/5, 81/25, 82/25, 83/25, 84/25, 1
7/5, 86/25, 87/25, 88/25, 89/25, 18/5, 91/25, 92/25, 93/25, 94/25, 19/5, 96/25,
```

```
97/25, 98/25, 99/25, 4, 101/25, 102/25, 103/25, 104/25, 21/5, 106/25, 107/25, 10
8/25, 109/25, 22/5, 111/25, 112/25, 113/25, 114/25, 23/5, 116/25, 117/25, 118/2
5, 119/25, 24/5, 121/25, 122/25, 123/25, 124/25, 5]
```

In [94]:

```
fx_n = [f(i).n() for i in x_n]
print(fx_n)
```

```
[0.198766110346413, 0.171635298059788, 0.146812316857729, 0.124277086815526, 0.1
03981396769993, 0.0858526106092449, 0.0697974983373062, 0.0557060869632120, 0.04
34554363981349, 0.0329132575783324, 0.0239413033573896, 0.0163984767339922, 0.01
01436151442419, 0.00503792334937608, 0.000947040460148846, -0.00225726149256947,
-0.00469573957095704, -0.00648068578484398, -0.00771525285934562, -0.00849307050
956210, -0.00889811900283019, -0.00900482453883451, -0.00887834014607166, -0.008
57497620240622, -0.00814274613994744, -0.00762199518288655, -0.0070460828842369
1, -0.00644209357520464, -0.00583155243607461, -0.00523112857718936, -0.00465331
014356115, -0.00410703991294440, -0.00359830305652836, -0.00313066161036370, -0.
00270573272387713, -0.00232360988966206, -0.00198322811418592, -0.00168267537472
325, -0.00141945374765137, -0.00119069431943031, -0.000993330441696020, -0.00082
4234106310649, -0.000680320235953846, -0.000558623550785691, -0.0004563524192340
44, -0.000370923764934813, -0.000299982712039365, -0.000241410232816423, -0.0001
93321635533923, -0.000154058313476336, -0.000122174780052744, -0.000096422649061
1852, -0.000075732888913596O, -0.000059197387953077 7, -0.000046050615715 3645, -
0.000035651951225 9880, -0.000027469072070 9682, -0.000021062654066 2000, -0.000016
0725173904158, -0.000012205267298 7625, -9.22341222260668e-6, -6.93589553680049e-
6, -5.18994613146826e-6, -3.86413407278593e-6, -2.86250834791475e-6, -2.10969161
066775e-6, -1.54680999477459e-6, -1.12814280976029e-6, -8.18385970530028e-7, -5.
90433311257880e-7, -4.23590719808116e-7, -3.02148732202803e-7, -2.14249451295721
e-7, -1.50993141962738e-7, -1.05738457275419e-7, -7.35578990780157e-8, -5.081680
52031925e-8, -3.48499194603671e-8, -2.37145023597288e-8, -1.60030594316718e-8, -
1.07021868159030e-8, -7.08684883626023e-9, -4.64169496027120e-9, -3.002873545530
88e-9, -1.91527937491887e-9, -1.20134526757157e-9, -7.38410770162629e-10, -4.424
20776654706e-10, -2.56264099151123e-10, -1.41489961308327e-10, -7.24665900972302
e-11, -3.22928681898483e-11, -9.95932445195542e-12, 1.60713538272926e-12, 6.8781
6737006145e-12, 8.62696715114811e-12, 8.53296582557051e-12, 7.58236485766128e-1
2, 6.33023902267403e-12, 5.06971894392175e-12, 3.93948450832630e-12]
```

In [95]:

```
print("Left endpoints: ", fx_n[:-1])
print("Right endpoints: ", fx_n[1:])
```

```
Left endpoints:  [0.198766110346413, 0.171635298059788, 0.146812316857729, 0.124
277086815526, 0.103981396769993, 0.0858526106092449, 0.0697974983373062, 0.05570
60869632120, 0.0434554363981349, 0.0329132575783324, 0.0239413033573896, 0.01639
84767339922, 0.0101436151442419, 0.00503792334937608, 0.000947040460148846, -0.0
0225726149256947, -0.00469573957095704, -0.00648068578484398, -0.007715252859345
62, -0.00849307050956210, -0.00889811900283019, -0.00900482453883451, -0.0088783
4014607166, -0.00857497620240622, -0.00814274613994744, -0.00762199518288655, -
0.00704608288423691, -0.00644209357520464, -0.00583155243607461, -0.005231128577
18936, -0.00465331014356115, -0.00410703991294440, -0.00359830305652836, -0.0031
3066161036370, -0.00270573272387713, -0.00232360988966206, -0.00198322811418592,
-0.00168267537472325, -0.00141945374765137, -0.00119069431943031, -0.00099333044
1696020, -0.000824234106310649, -0.000680320235953846, -0.000558623550785691, -
0.000456352419234044, -0.000370923764934813, -0.000299982712039365, -0.000241410
232816423, -0.000193321635533923, -0.000154058313476336, -0.000122174780052744,
-0.000096422649061852, -0.000075732888913596O, -0.000059197387953077 7, -0.00004
60506157153645, -0.000035651951225 9880, -0.000027469072070 9682, -0.0000210626540
662000, -0.000016072517390 4158, -0.000012205267298 7625, -9.22341222260668e-6, -
6.93589553680049e-6, -5.18994613146826e-6, -3.86413407278593e-6, -2.862508347914
75e-6, -2.10969161066775e-6, -1.54680999477459e-6, -1.12814280976029e-6, -8.1838
5970530028e-7, -5.90433311257880e-7, -4.23590719808116e-7, -3.02148732202803e-7,
-2.14249451295721e-7, -1.50993141962738e-7, -1.05738457275419e-7, -7.35578990780
157e-8, -5.08168052031925e-8, -3.48499194603671e-8, -2.37145023597288e-8, -1.600
30594316718e-8, -1.07021868159030e-8, -7.08684883626023e-9, -4.64169496027120e-
9, -3.00287354553088e-9, -1.91527937491887e-9, -1.20134526757157e-9, -7.38410770
```

```
162629e-10, -4.42420776654706e-10, -2.56264099151123e-10, -1.41489961308327e-10,
-7.24665900972302e-11, -3.22928681898483e-11, -9.95932445195542e-12, 1.607135382
72926e-12, 6.87816737006145e-12, 8.62696715114811e-12, 8.53296582557051e-12, 7.5
8236485766128e-12, 6.33023902267403e-12, 5.06971894392175e-12]
Right endpoints:  [0.171635298059788, 0.146812316857729, 0.124277086815526, 0.10
3981396769993, 0.0858526106092449, 0.0697974983373062, 0.0557060869632120, 0.043
4554363981349, 0.0329132575783324, 0.0239413033573896, 0.0163984767339922, 0.010
1436151442419, 0.00503792334937608, 0.000947040460148846, -0.00225726149256947,
-0.00469573957095704, -0.00648068578484398, -0.00771525285934562, -0.00849307050
956210, -0.00889811900283019, -0.00900482453883451, -0.00887834014607166, -0.008
57497620240622, -0.00814274613994744, -0.00762199518288655, -0.0070460828842369
1, -0.00644209357520464, -0.00583155243607461, -0.00523112857718936, -0.00465331
014356115, -0.00410703991294440, -0.00359830305652836, -0.00313066161036370, -0.
00270573272387713, -0.00232360988966206, -0.00198322811418592, -0.00168267537472
325, -0.00141945374765137, -0.00119069431943031, -0.000993330441696020, -0.00082
4234106310649, -0.000680320235953846, -0.000558623550785691, -0.0004563524192340
44, -0.000370923764934813, -0.000299982712039365, -0.000241410232816423, -0.0001
93321635533923, -0.000154058313476336, -0.000122174780052744, -0.000096422649061
1852, -0.0000757328889135960, -0.0000591973879530777, -0.0000460506157153645, -
0.0000356519512259880, -0.0000274690720709682, -0.0000210626540662000, -0.000016
0725173904158, -0.0000122052672987625, -9.22341222260668e-6, -6.935895536800 49e-
6, -5.18994613146826e-6, -3.86413407278593e-6, -2.86250834791475e-6, -2.10969161
066775e-6, -1.54680999477459e-6, -1.12814280976029e-6, -8.18385970530028e-7, -5.
90433311257880e-7, -4.23590719808116e-7, -3.02148732202803e-7, -2.14249451295721
e-7, -1.50993141962738e-7, -1.05738457275419e-7, -7.35578990780157e-8, -5.081680
52031925e-8, -3.48499194603671e-8, -2.37145023597288e-8, -1.60030594316718e-8, -
1.07021868159030e-8, -7.08684883626023e-9, -4.64169496027120e-9, -3.002873545530
88e-9, -1.91527937491887e-9, -1.20134526757157e-9, -7.38410770162629e-10, -4.424
20776654706e-10, -2.56264099151123e-10, -1.41489961308327e-10, -7.24665900972302
e-11, -3.22928681898483e-11, -9.95932445195542e-12, 1.60713538272926e-12, 6.8781
6737006145e-12, 8.62696715114811e-12, 8.53296582557051e-12, 7.58236485766128e-1
2, 6.33023902267403e-12, 5.06971894392175e-12, 3.93948450832630e-12]
```

In [96]:

```
L = (b-a)/n * sum(fx_n[:-1])
R = (b-a)/n * sum(fx_n[1:])
print("Left Approximation: ", L)
print("Right Approximation: ", R)
```

```
Left Approximation:  0.0380894635026723
Right Approximation:  0.0301388190889734
```

In [0]: