MATH 308

Final Project

ALFRED CHIEN

87050019

Topic

The Measurement of Pi

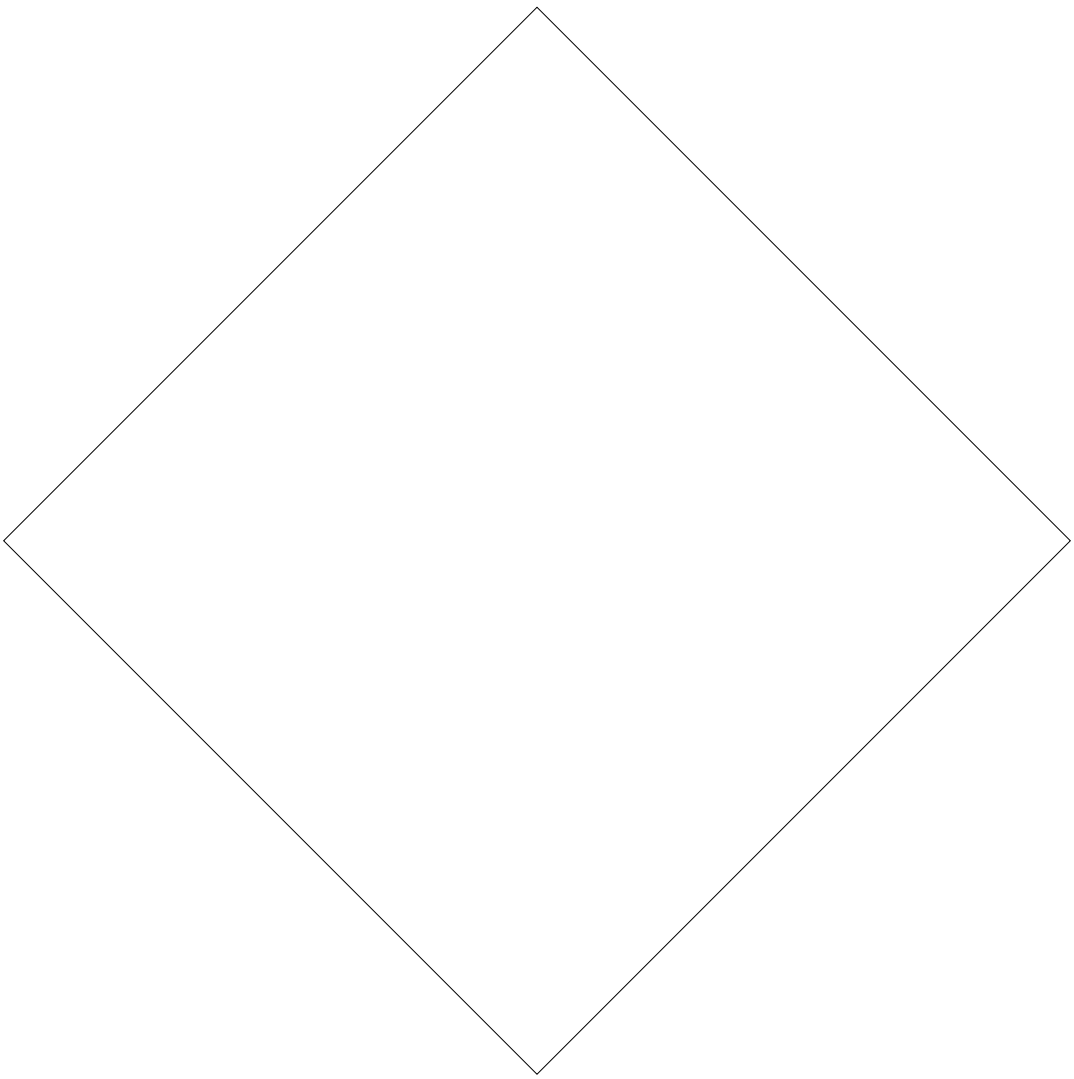
ARCHIMEDUS METHOD:

Archimedes was the first to give a scientific method for calculating to arbitrary accuracy. He realized that the perimeter of a regular polygon of n sides inscribed in a circle is smaller than the circumference of that circle, and that the perimeter of a regular polygon of n sides circumscribed around a circle is greater than the circumference of that circle.
As n approaches infinity, the two perimeters approach the circumference.

Here’s the Polygon

which is going to be put inside a circle

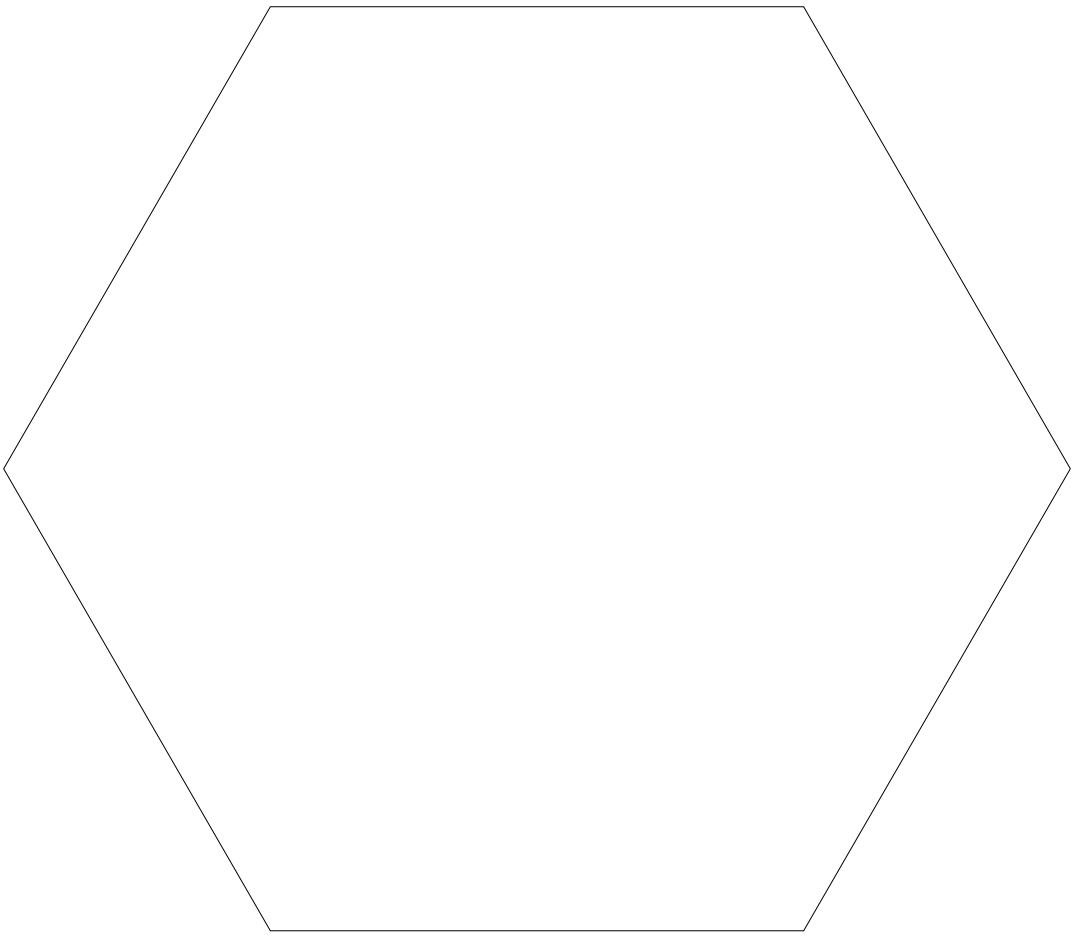
"Let’s assume it has four side first"



Here’s the Polygon

which is going to be put inside a circle

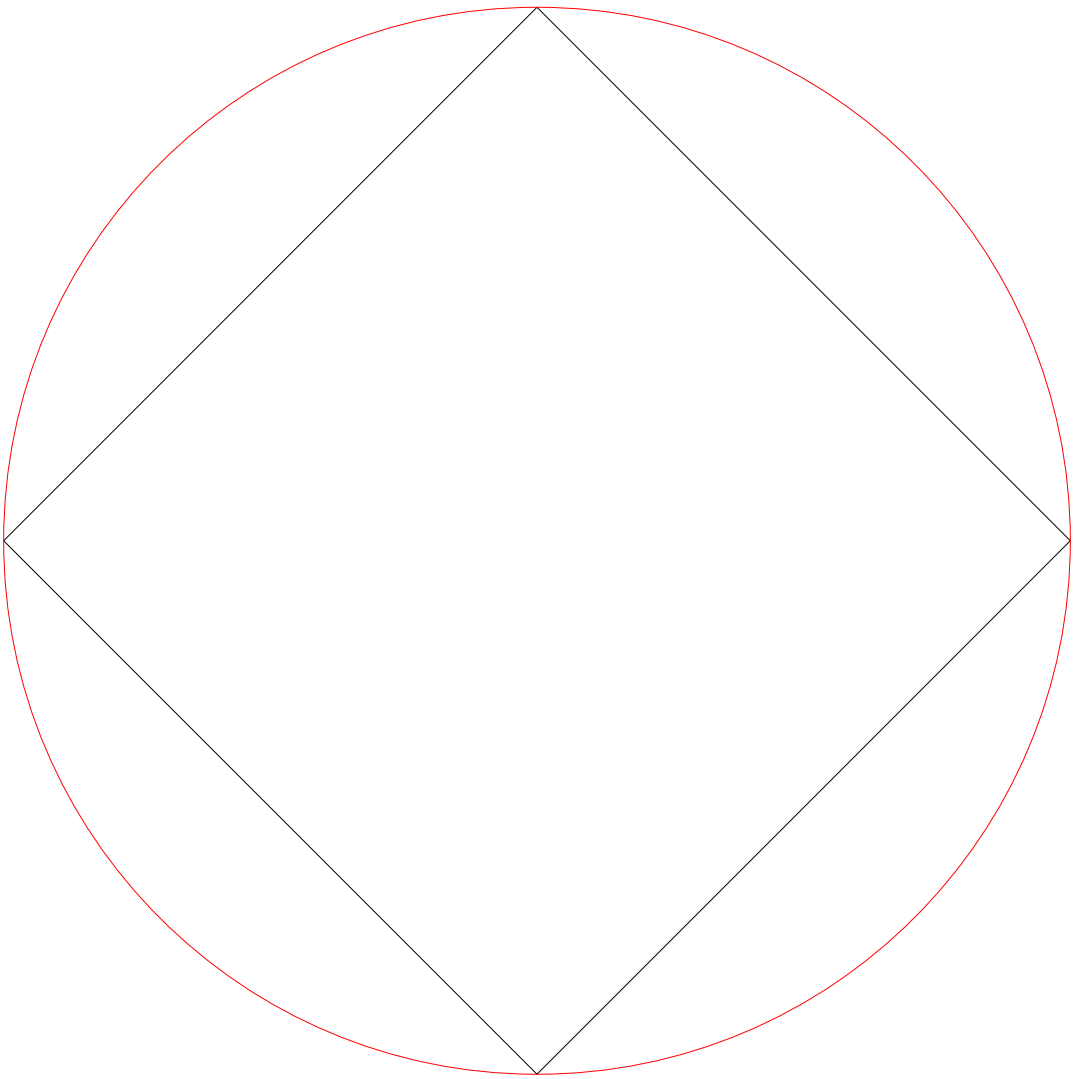
with side =6



Here’s the Polygon

inside a circle

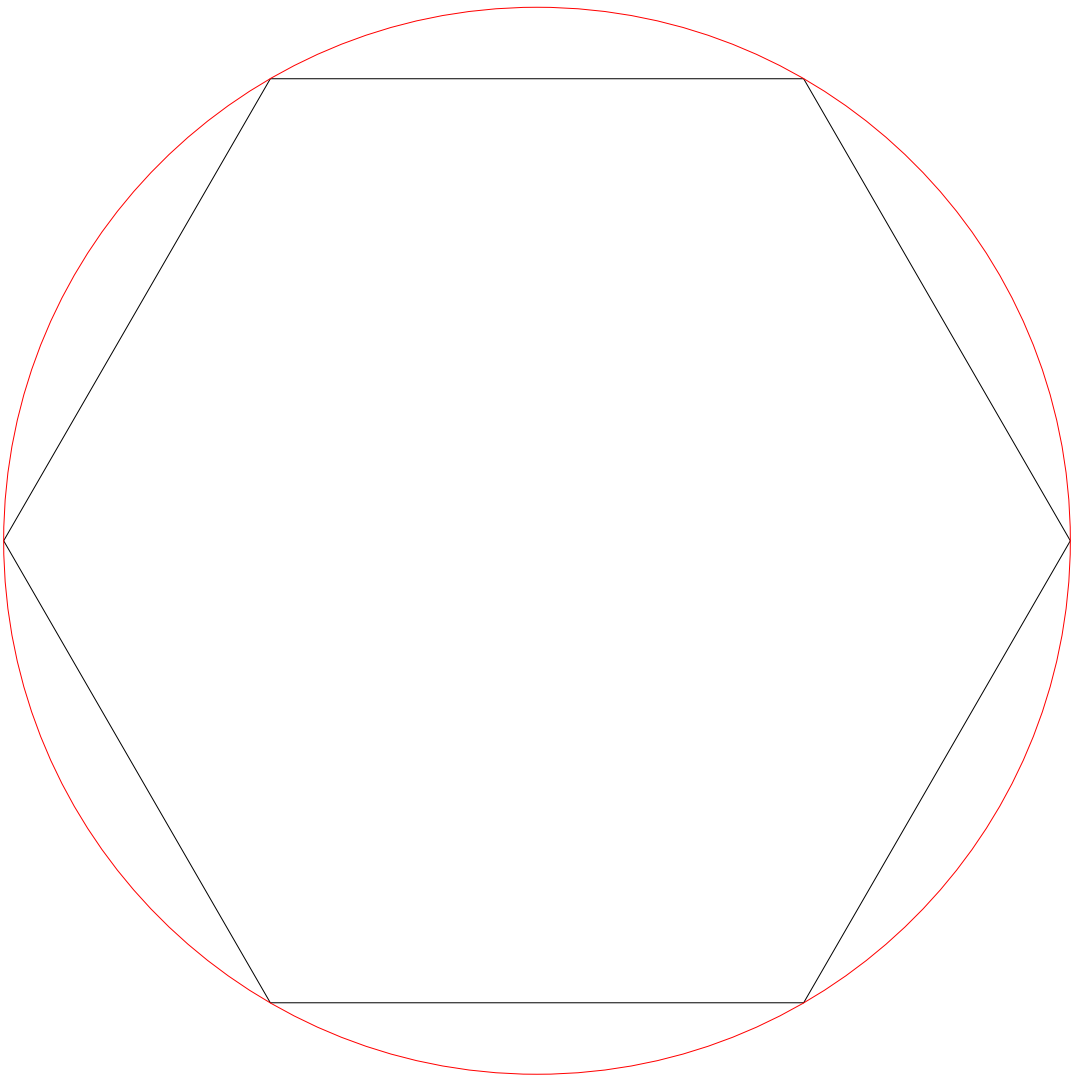
with side =4



Here’s the Polygon

inside a circle

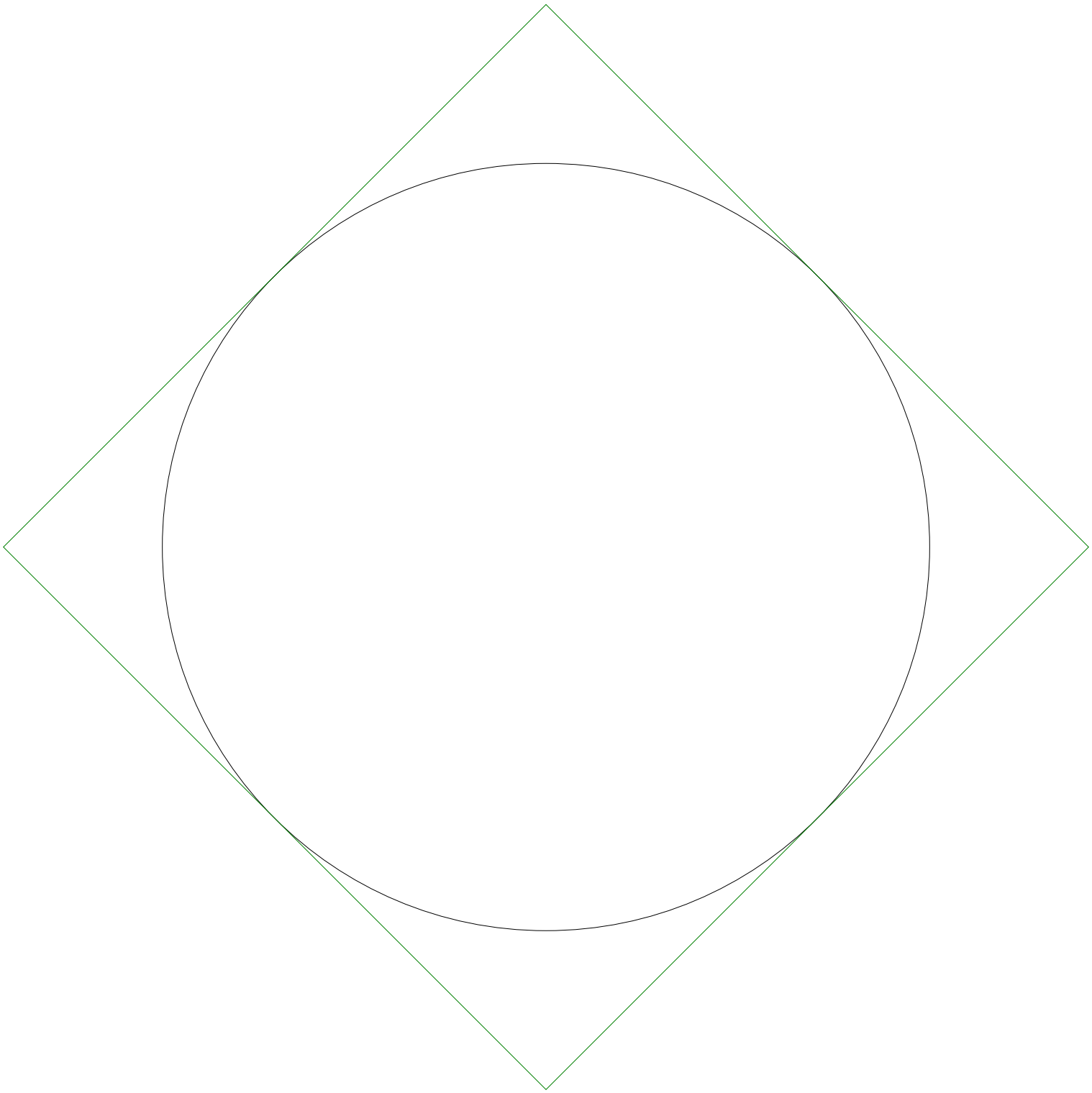
with side =6



Here’s the Circle

inside a polygon

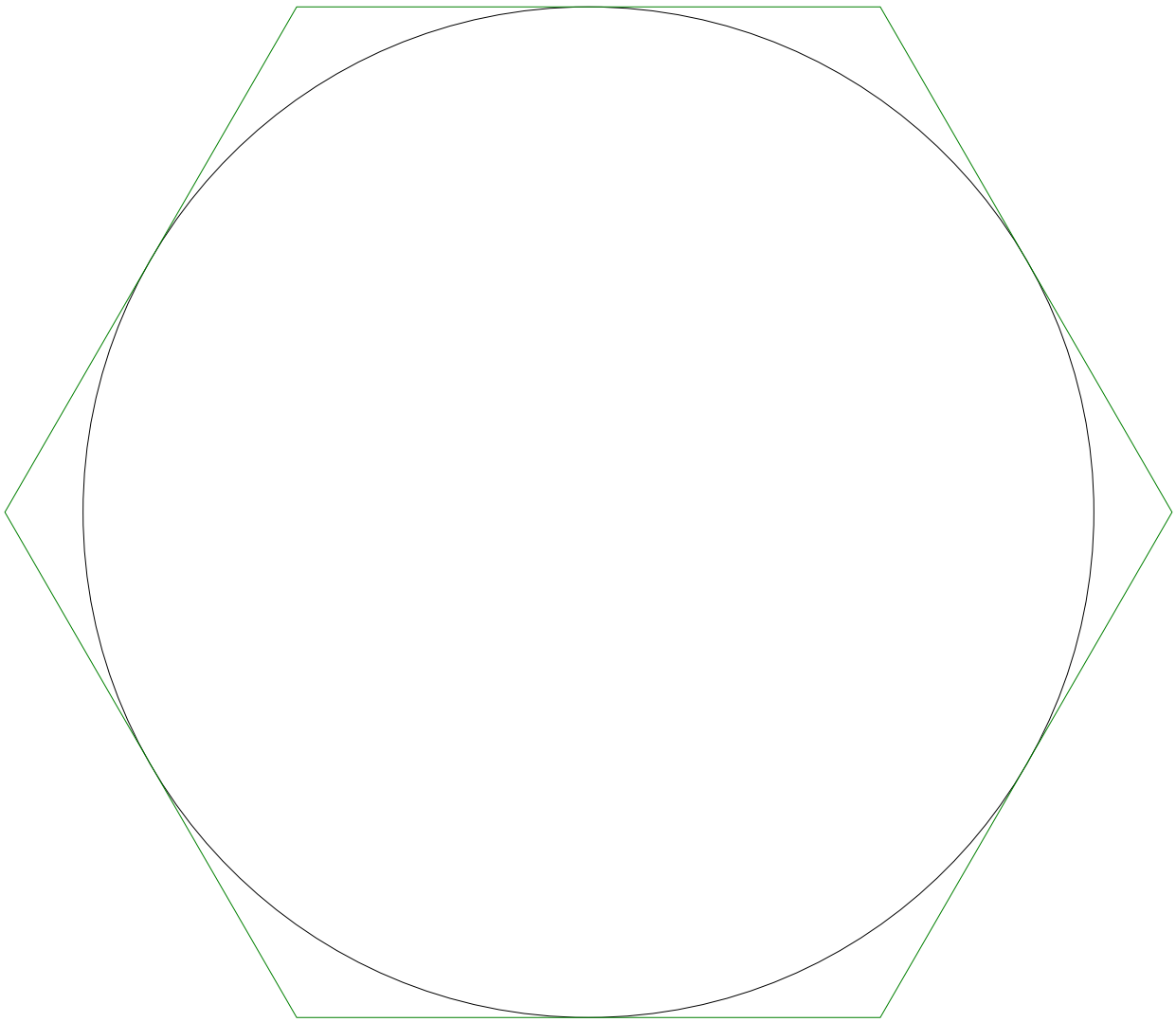
with side =4



Here’s the Circle

inside a Polygon

with side =6



ACCORDING TO ARCHIMEDUS METHOD(1):

We realized that the circumference is in between the Outscribe Polygon and the Inscribe Polygon. Therefore, we conclude that if the circle is a unit circle, PI is in between the parameter of Inscribe Polygon and the parameter of the Outscribe Polygon

Start with Law of Cosine

$c^2 = a^2 + b^2 - 2ab \cos T$

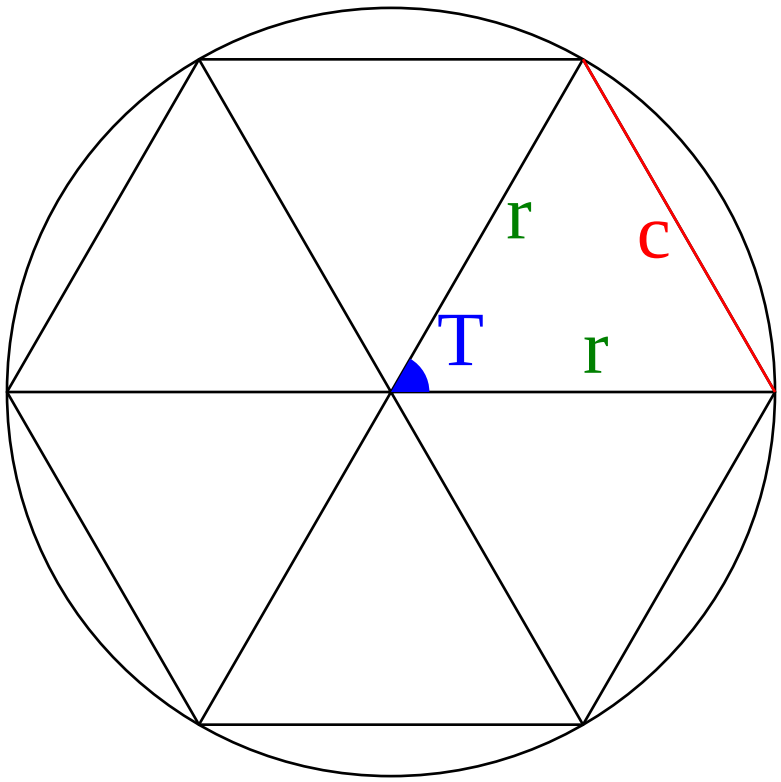
$c^2 = 2r^2 - 2r^2 \cos T$; since a=b=radius

$c^2 = 2r^2 (1-\cos T)$

$c^2 = 4r^2 \sin^2 (T/2)$

-using the sin half angle formula

$c = 2r \sin (T/2)$



ACCORDING TO ARCHIMEDUS METHOD(2):

One side of a n-gon inside a circle

will have a length calculated as:

$$n \sin (T/2)$$

In addition, one side of a n-gon outside a circle

will have a length calculated as:

$$n \tan (T/2)$$

Therefore, we can conclude that :

PI will be in between The Perimeter

of the Inscribe n-gon and the Perimeter

of the Outscribe n-gon

As a result:

Perimeter of Inscribe n-gon < PI< Perimeter of Outscribe n-gon

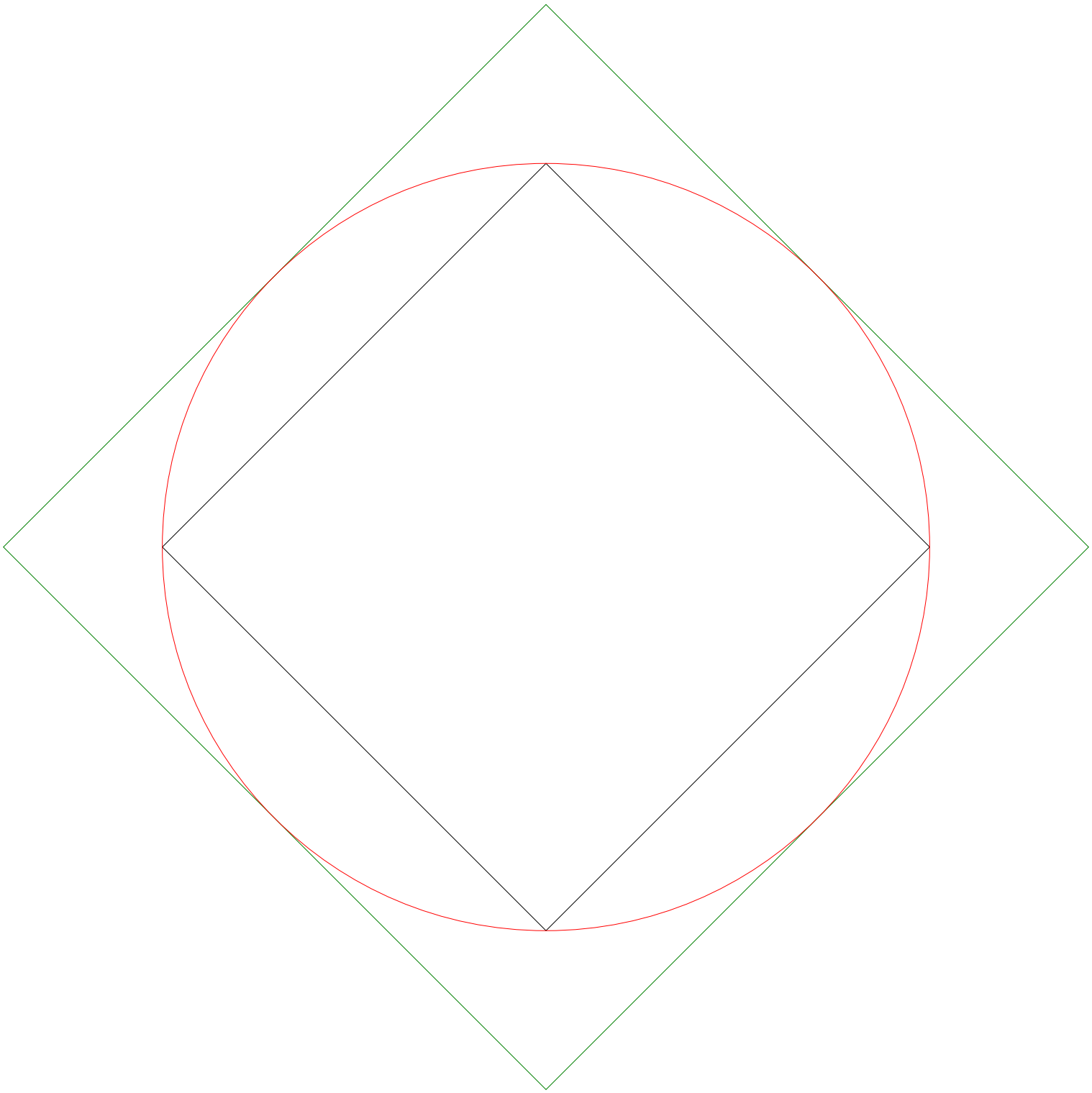
Starting the next page,
I will present the range of PI
from 4-gon to 108-gon

Please look at the top-left and figure
the changes when n changed!

Please enjoy!

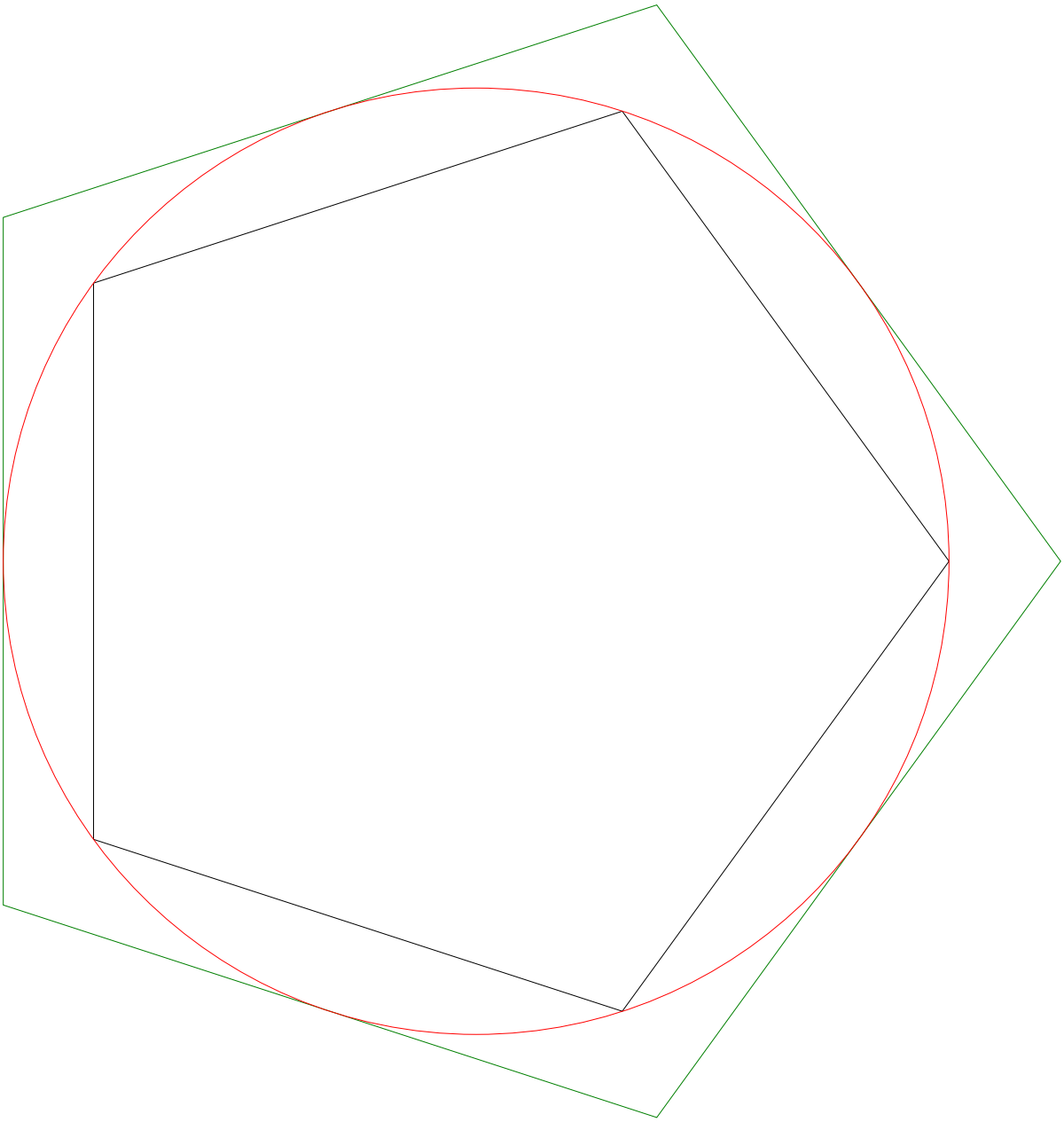
n-gon = 4

2.82843 < Pi < 4.0



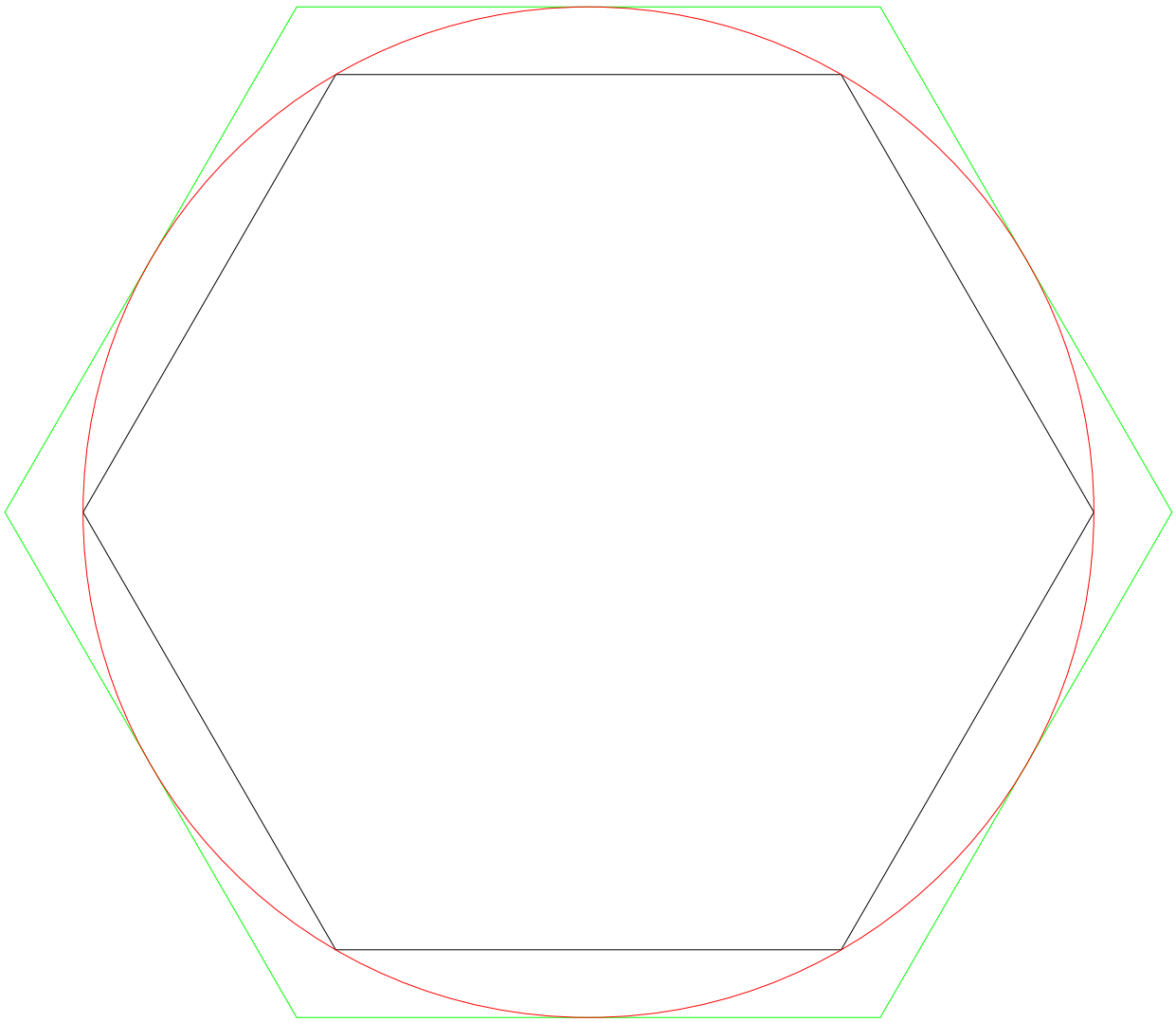
n-gon = 5

2.93893 < Pi < 3.63271



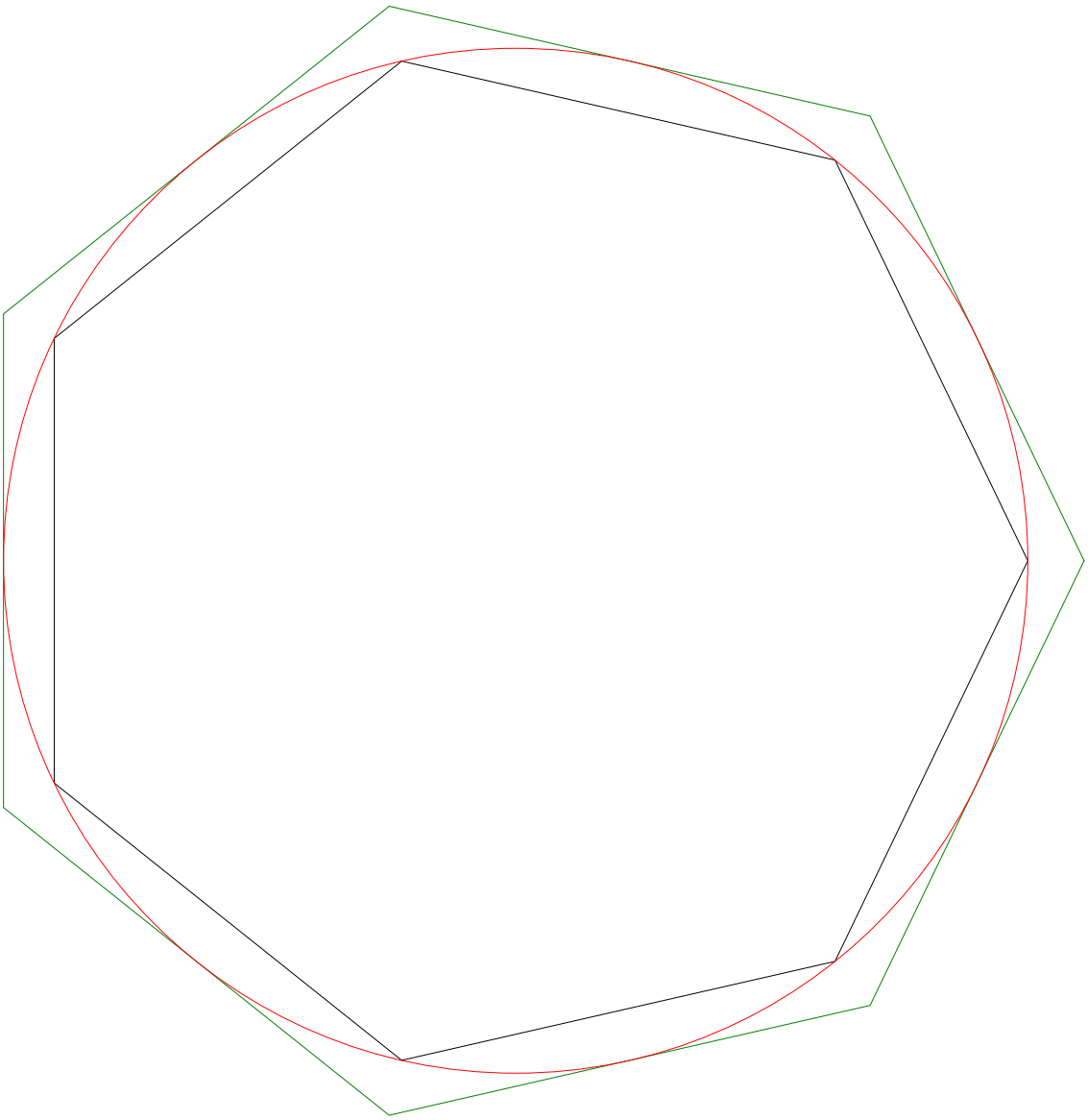
n-gon = 6

3.0 < Pi < 3.4641



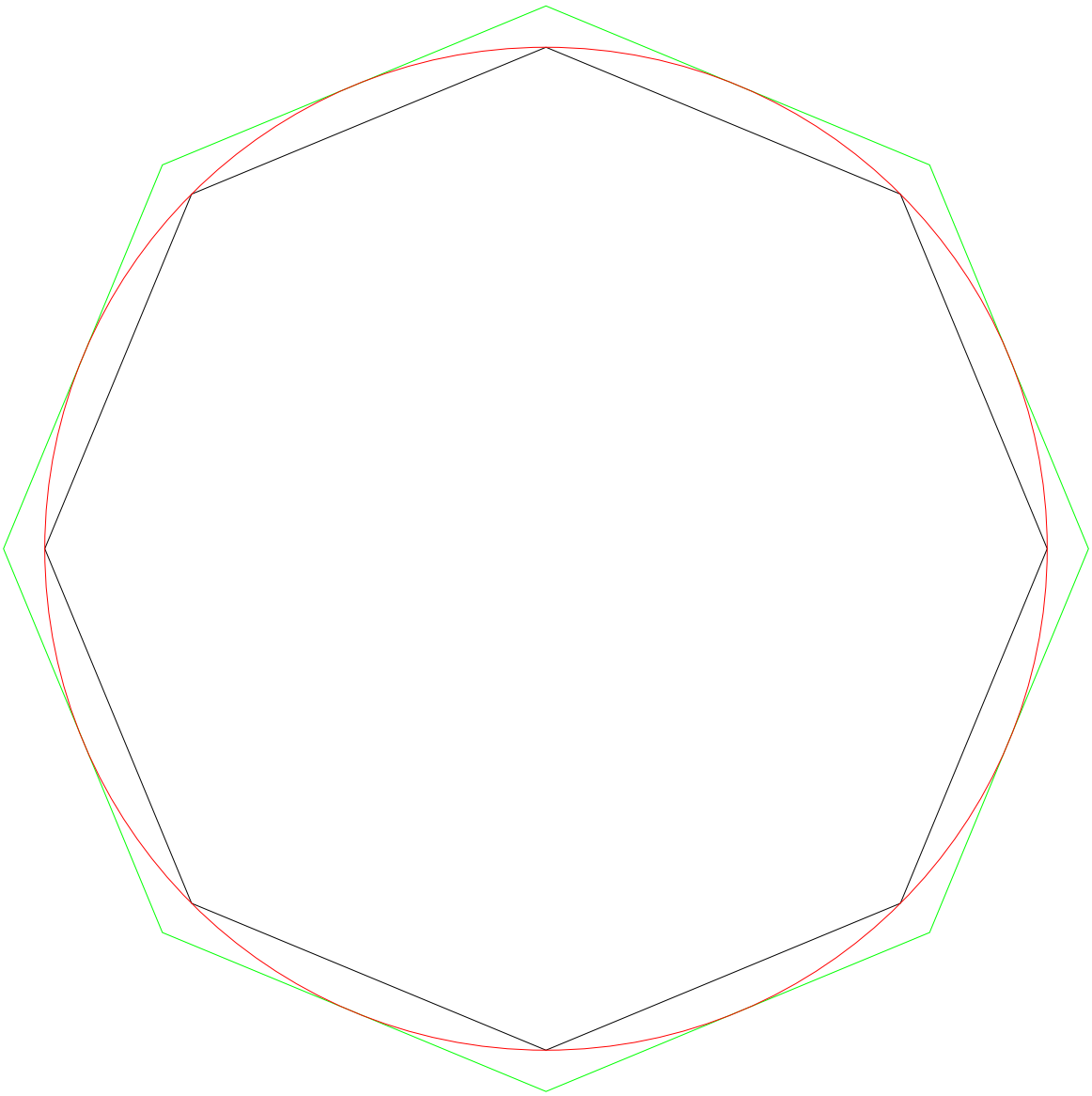
n-gon = 7

3.03719 < Pi < 3.37102



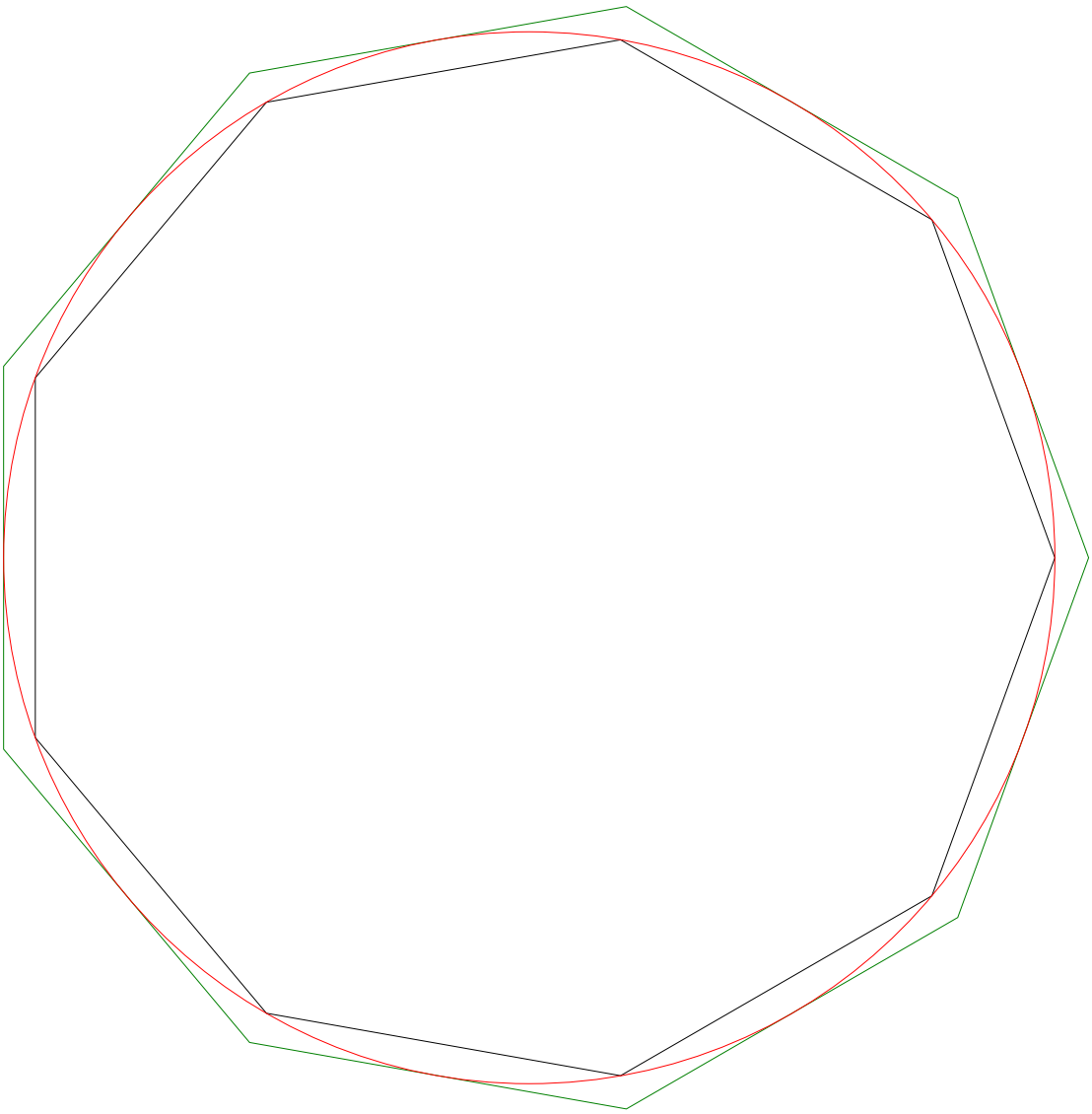
n-gon = 8

3.06147 < Pi < 3.31371



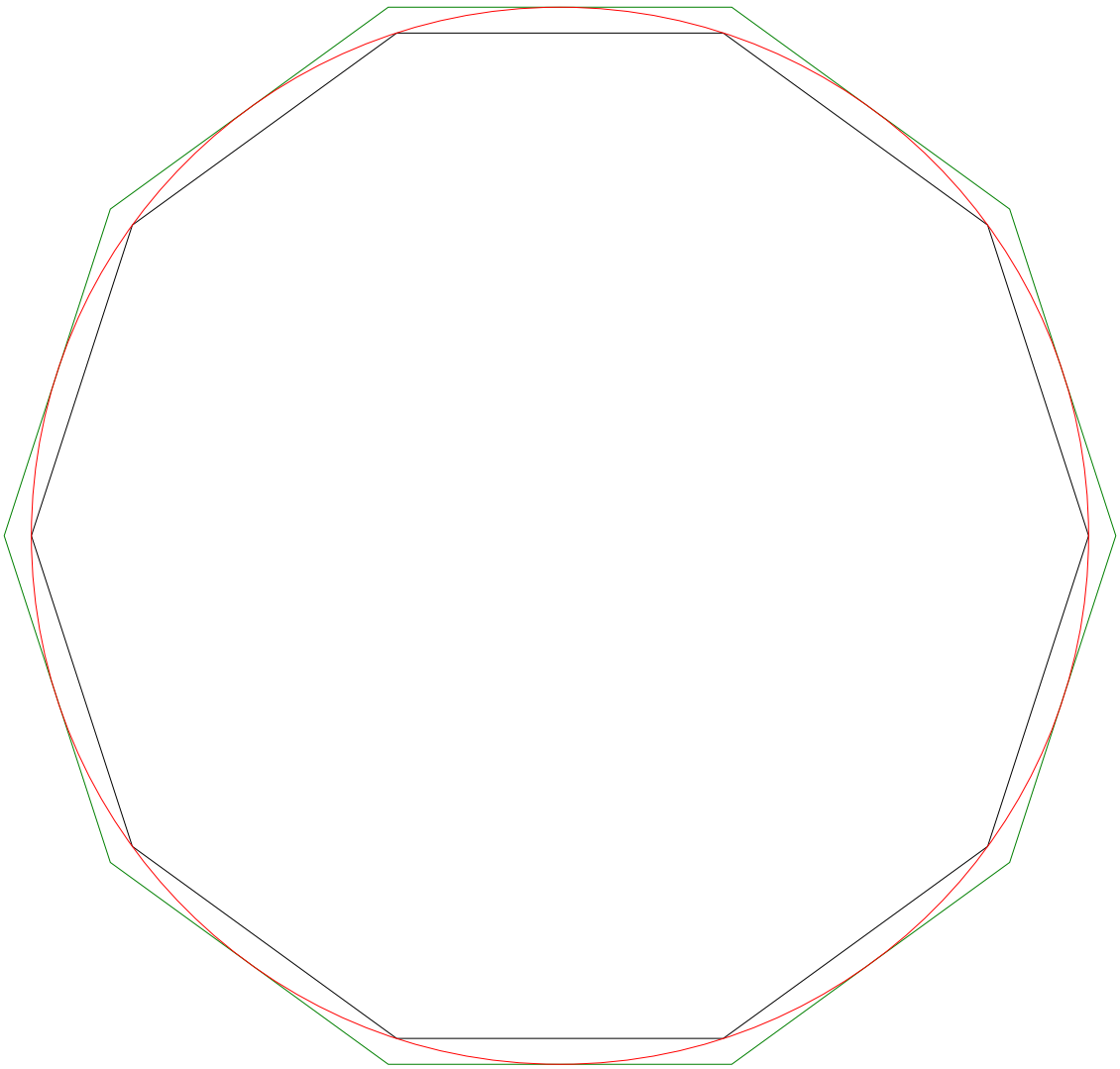
n-gon = 9

3.07818 < Pi < 3.27573



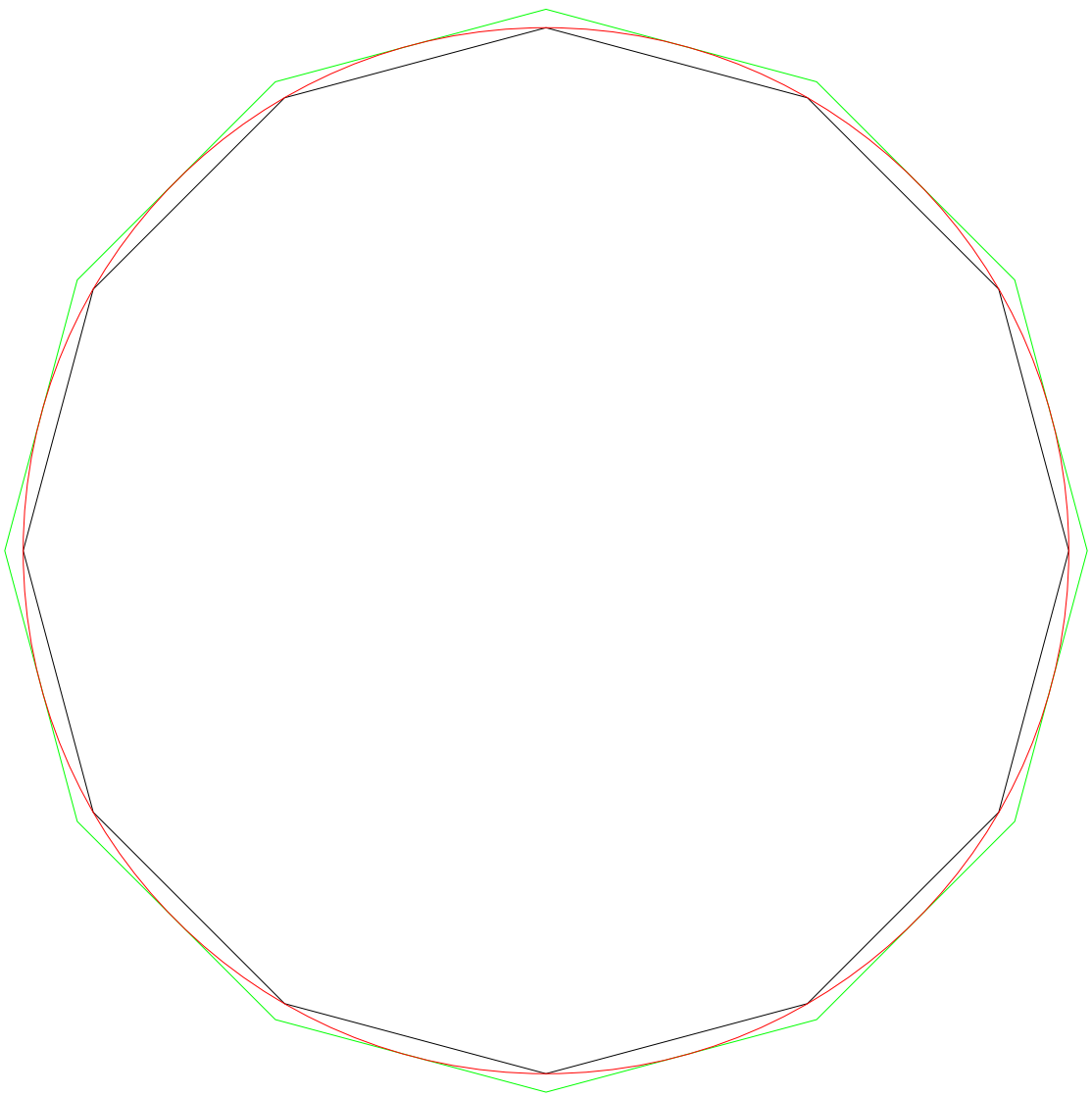
n-gon = 10

3.09017 < Pi < 3.2492



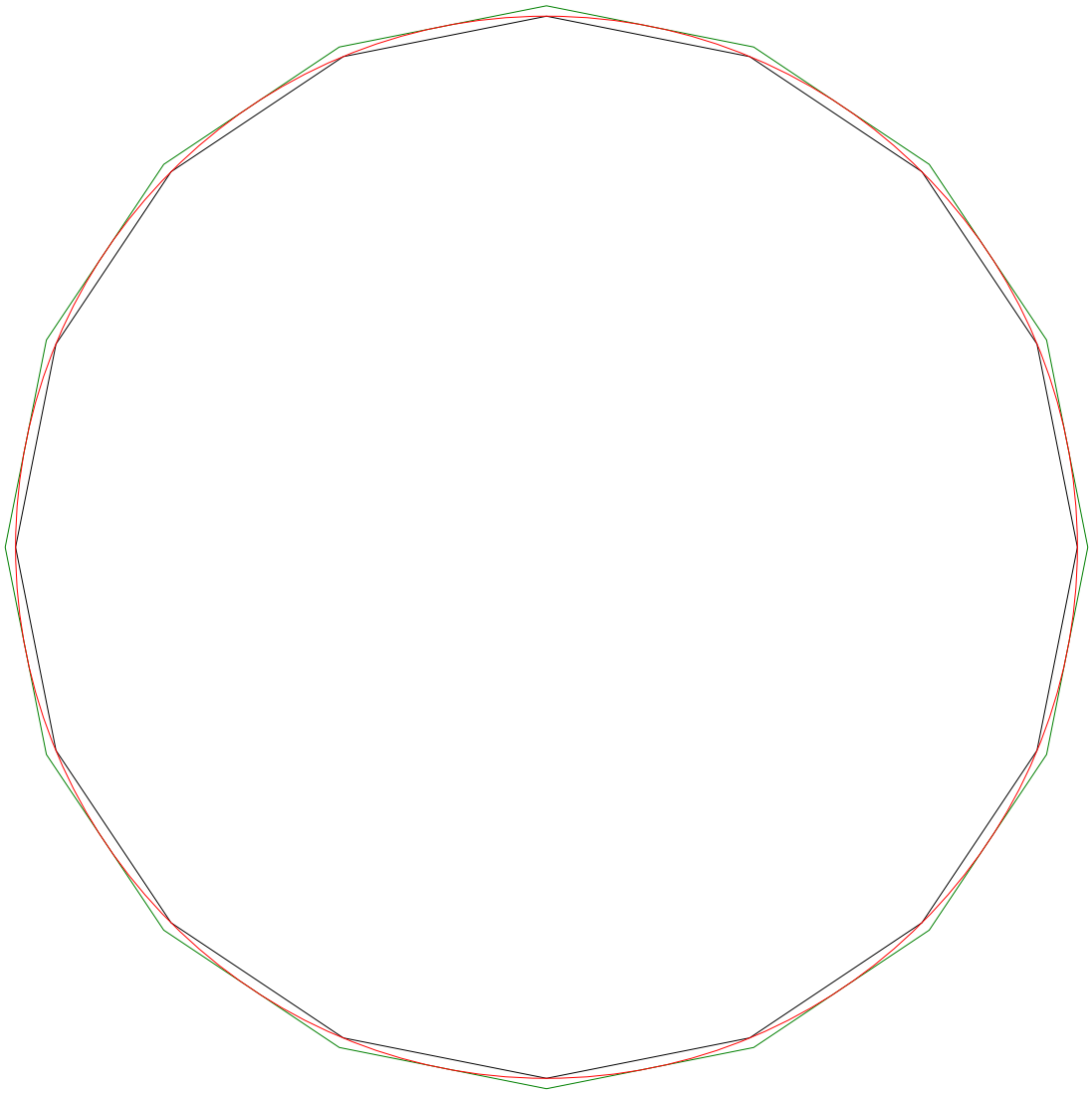
n-gon = 12

3.10583 < Pi < 3.21539



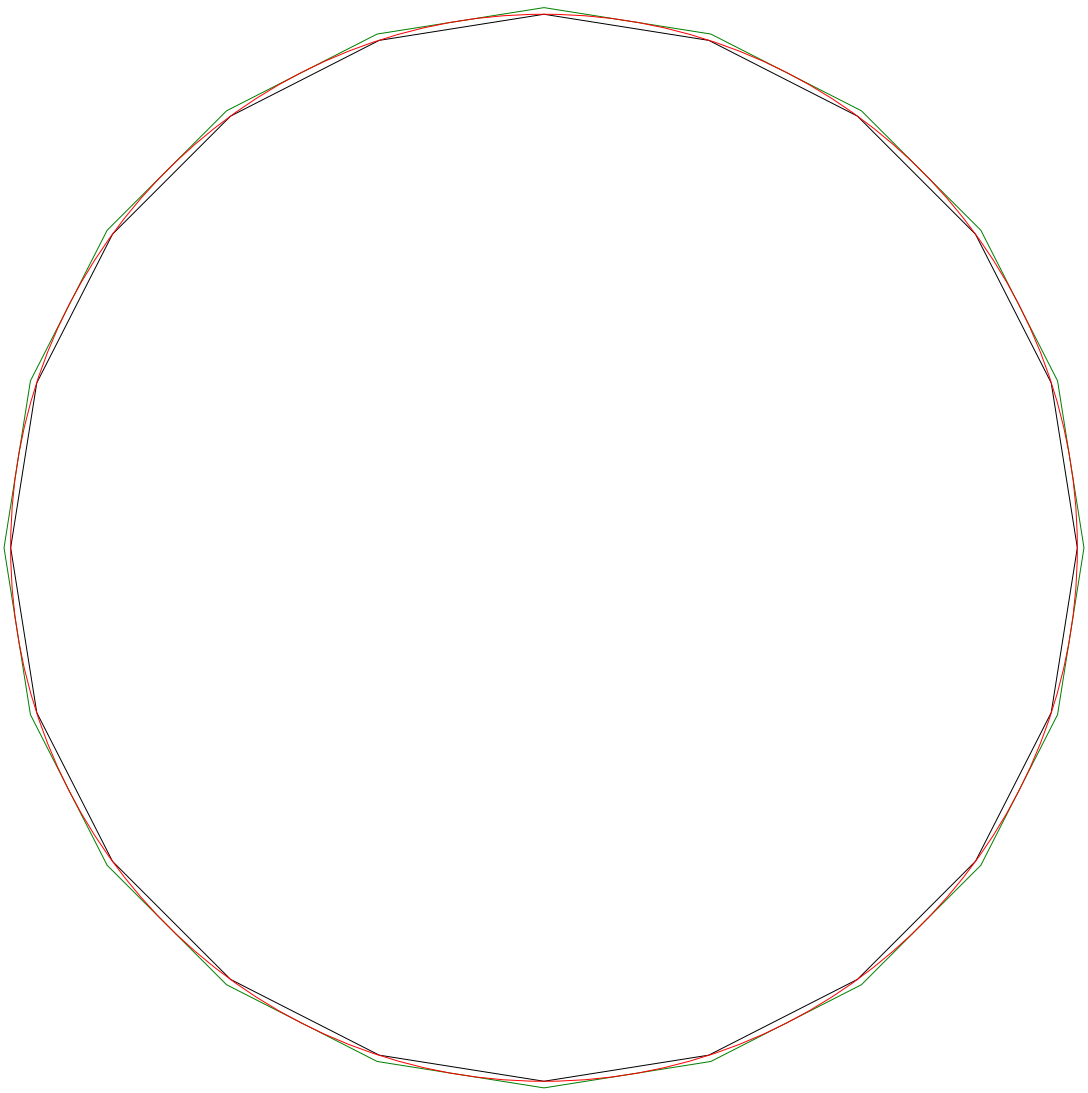
n-gon = 16

3.12145 < Pi < 3.1826



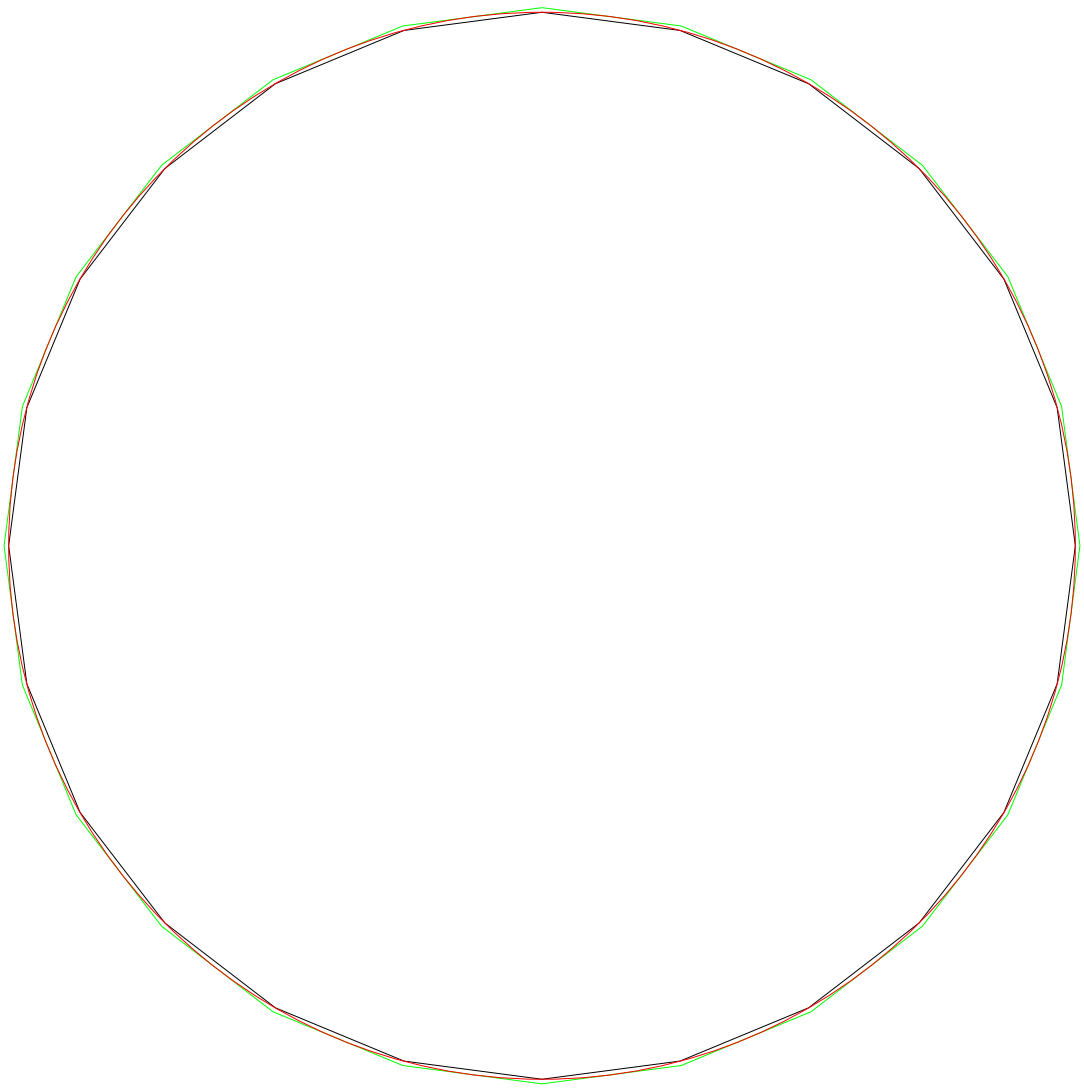
n-gon = 20

3.12869 < Pi < 3.16769



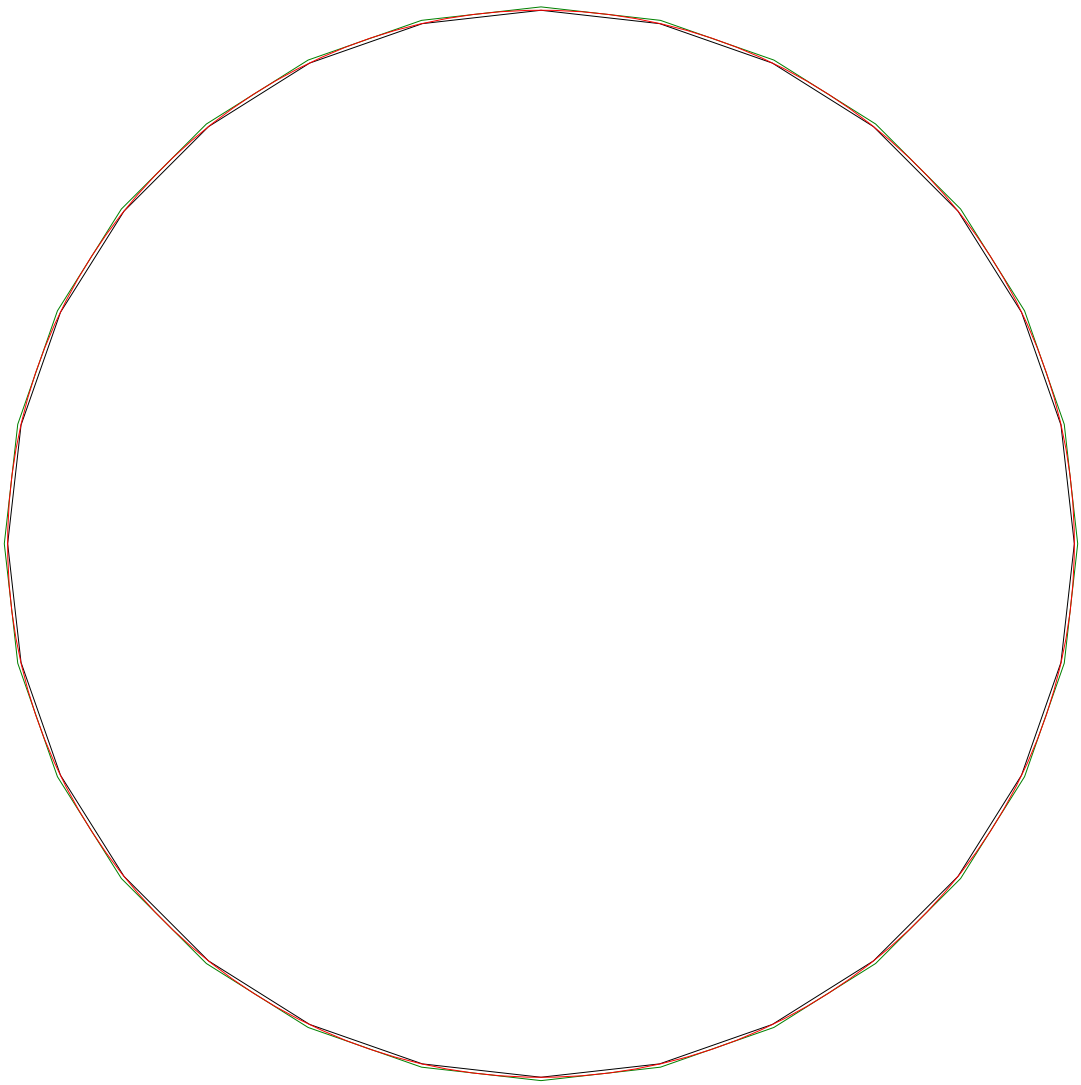
n-gon = 24

3.13263 < Pi < 3.15966



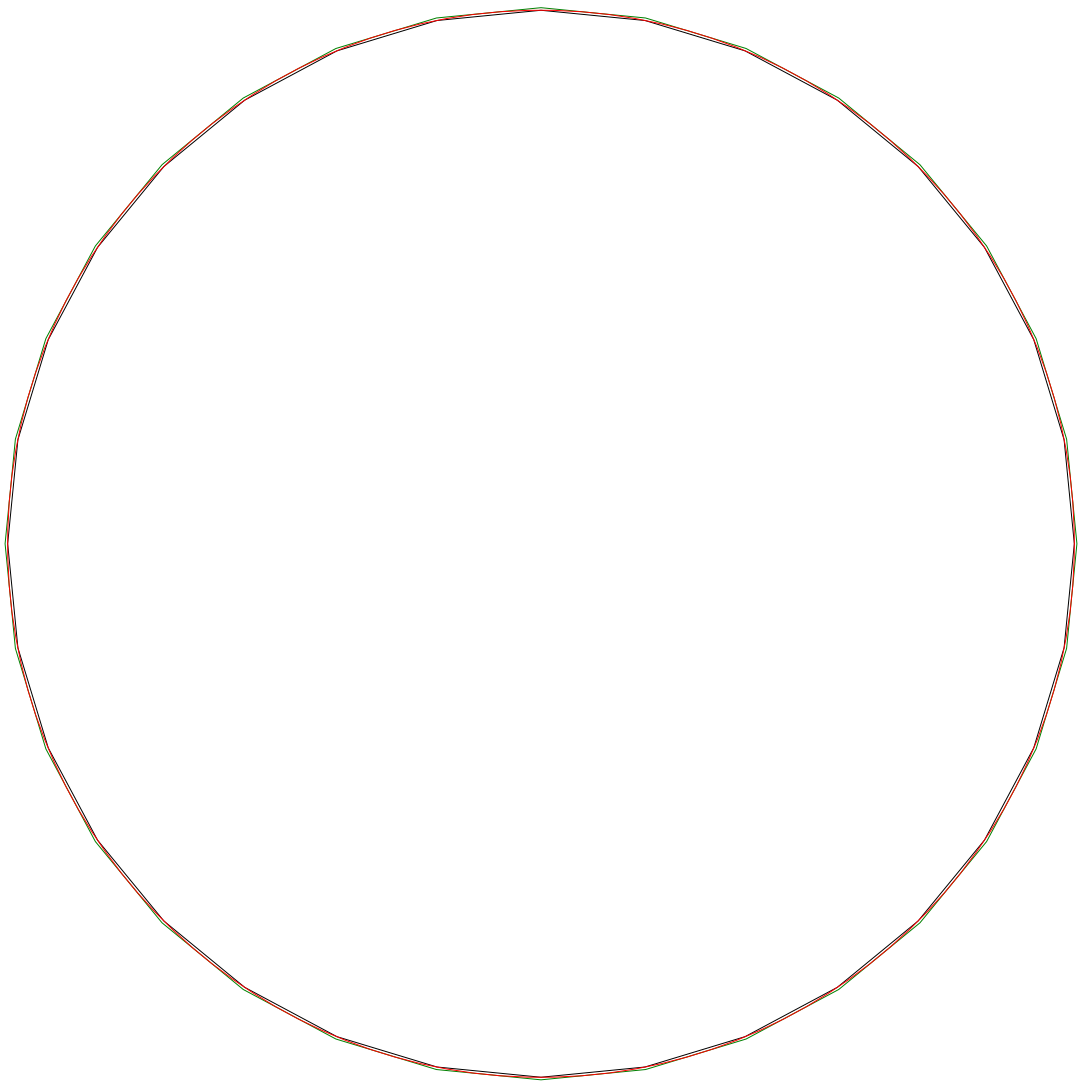
n-gon = 28

3.13501 < Pi < 3.15484



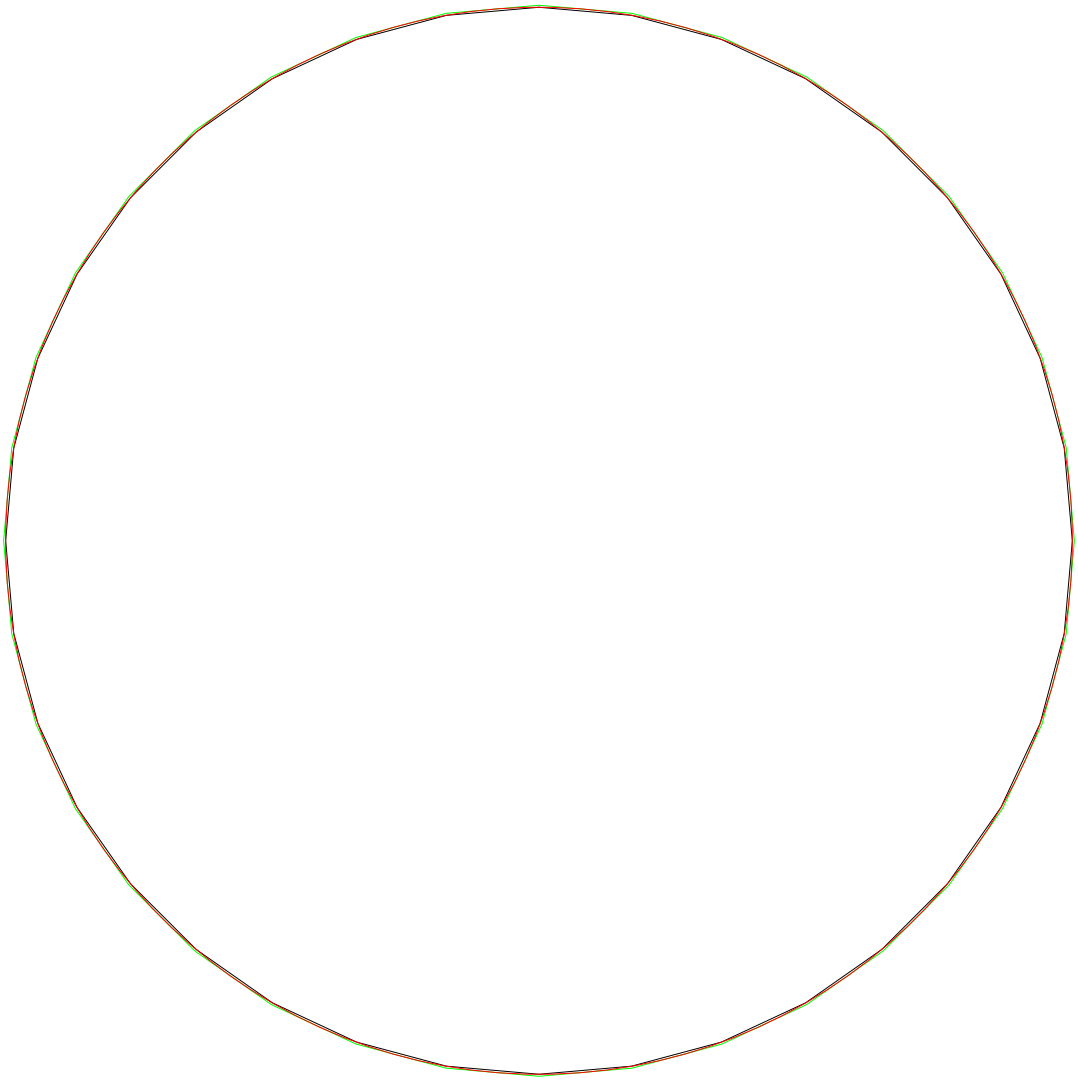
n-gon = 32

3.13655 < Pi < 3.15173



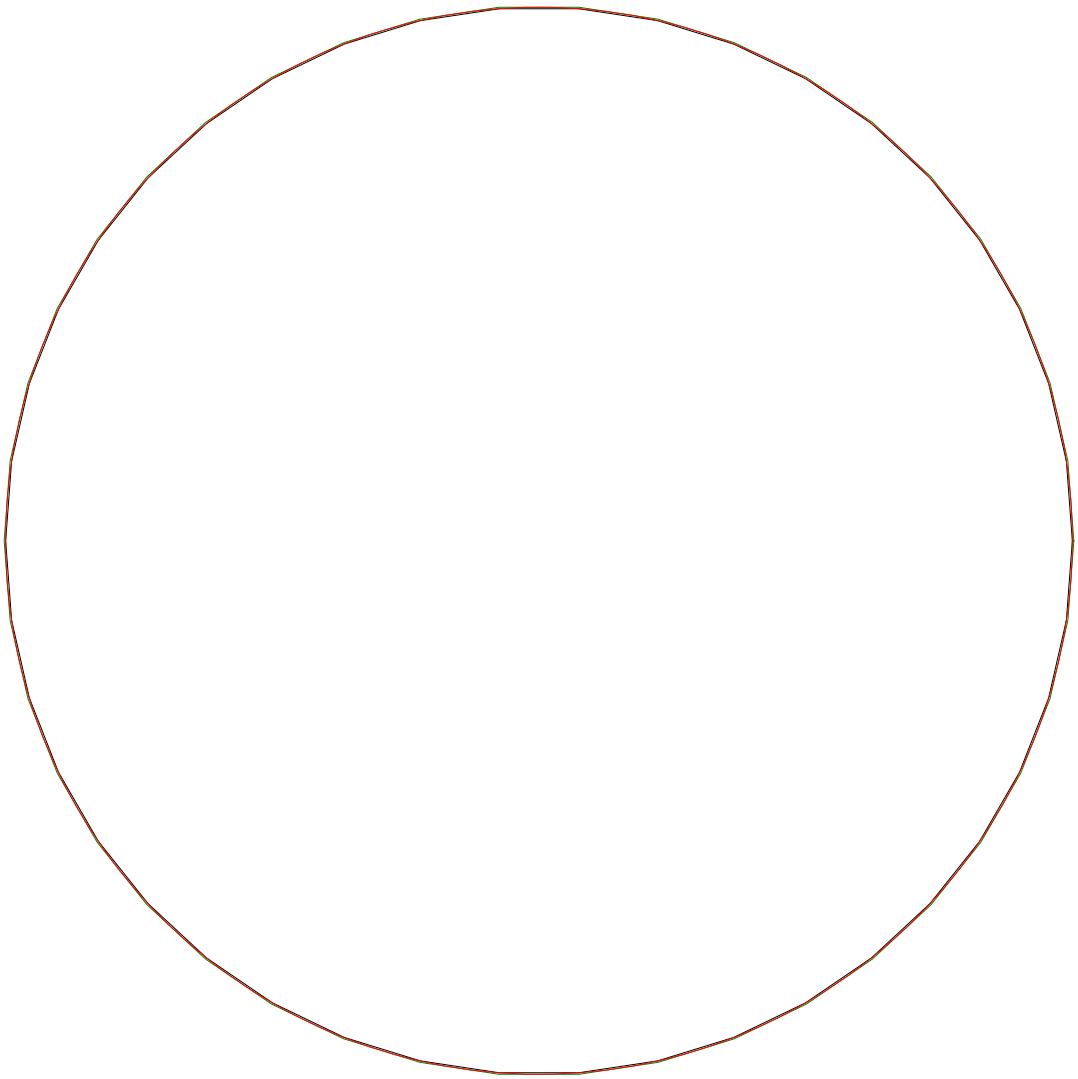
n-gon = 36

3.13761 < Pi < 3.14959



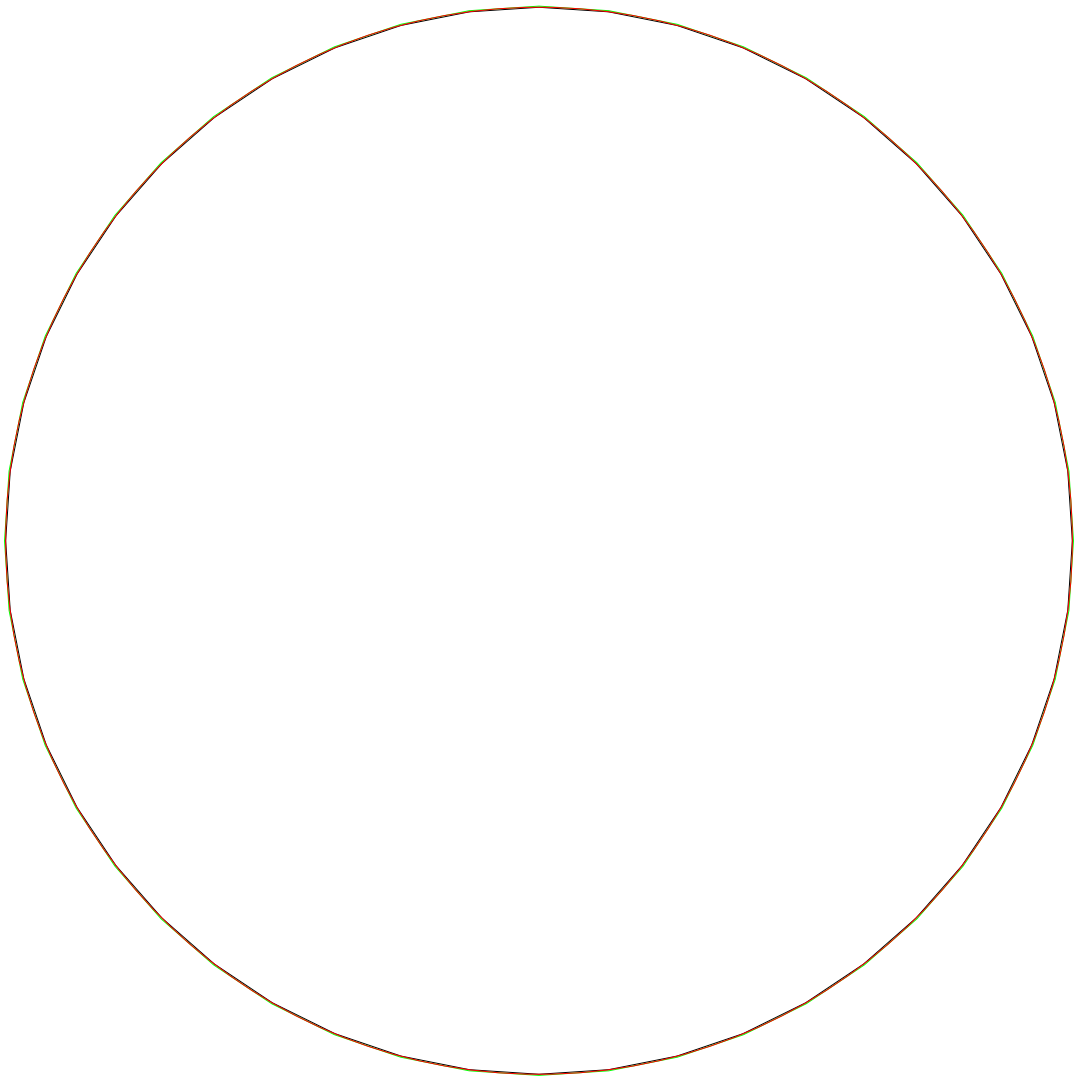
n-gon = 42

3.13866 < Pi < 3.14746



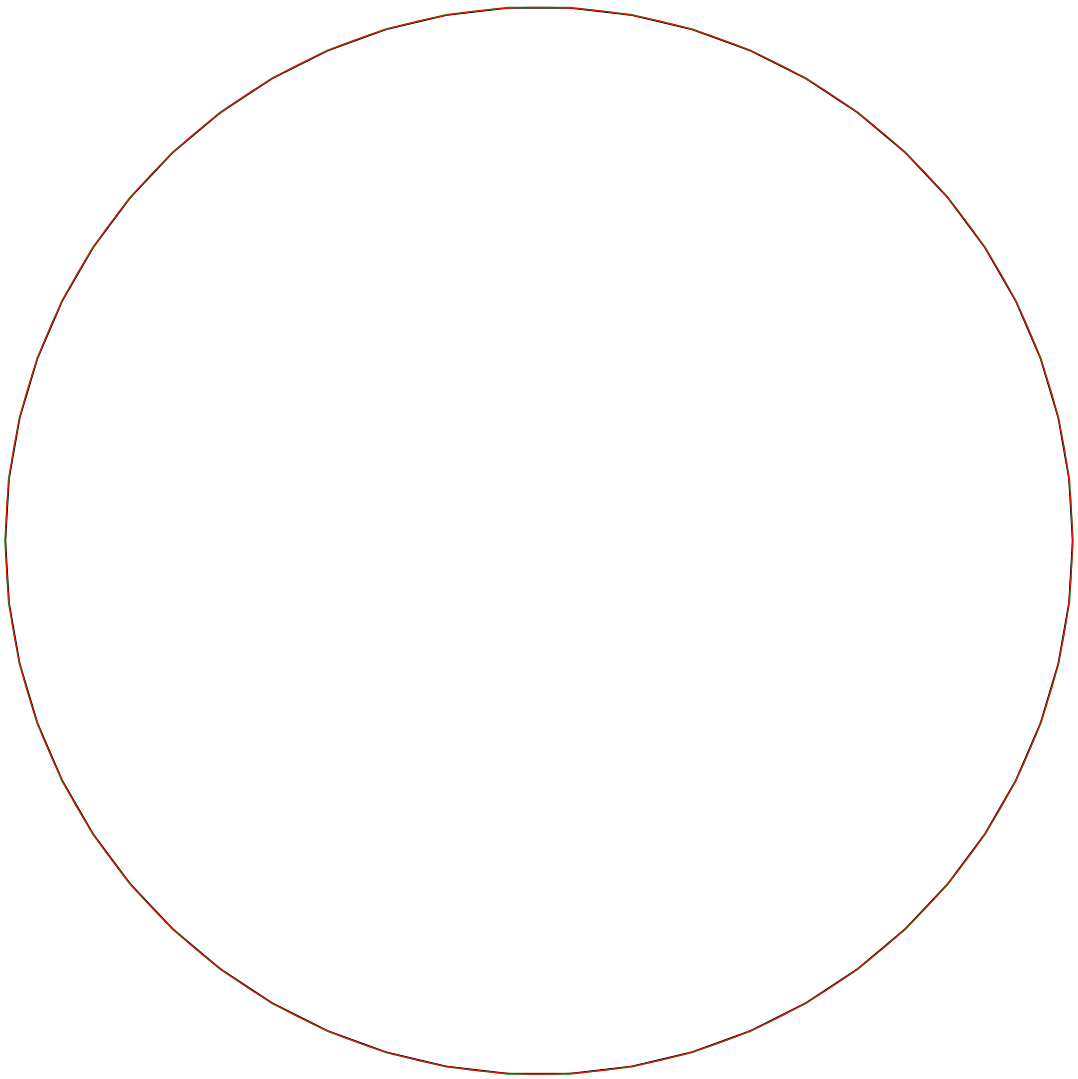
n-gon = 48

3.13935 < Pi < 3.14609



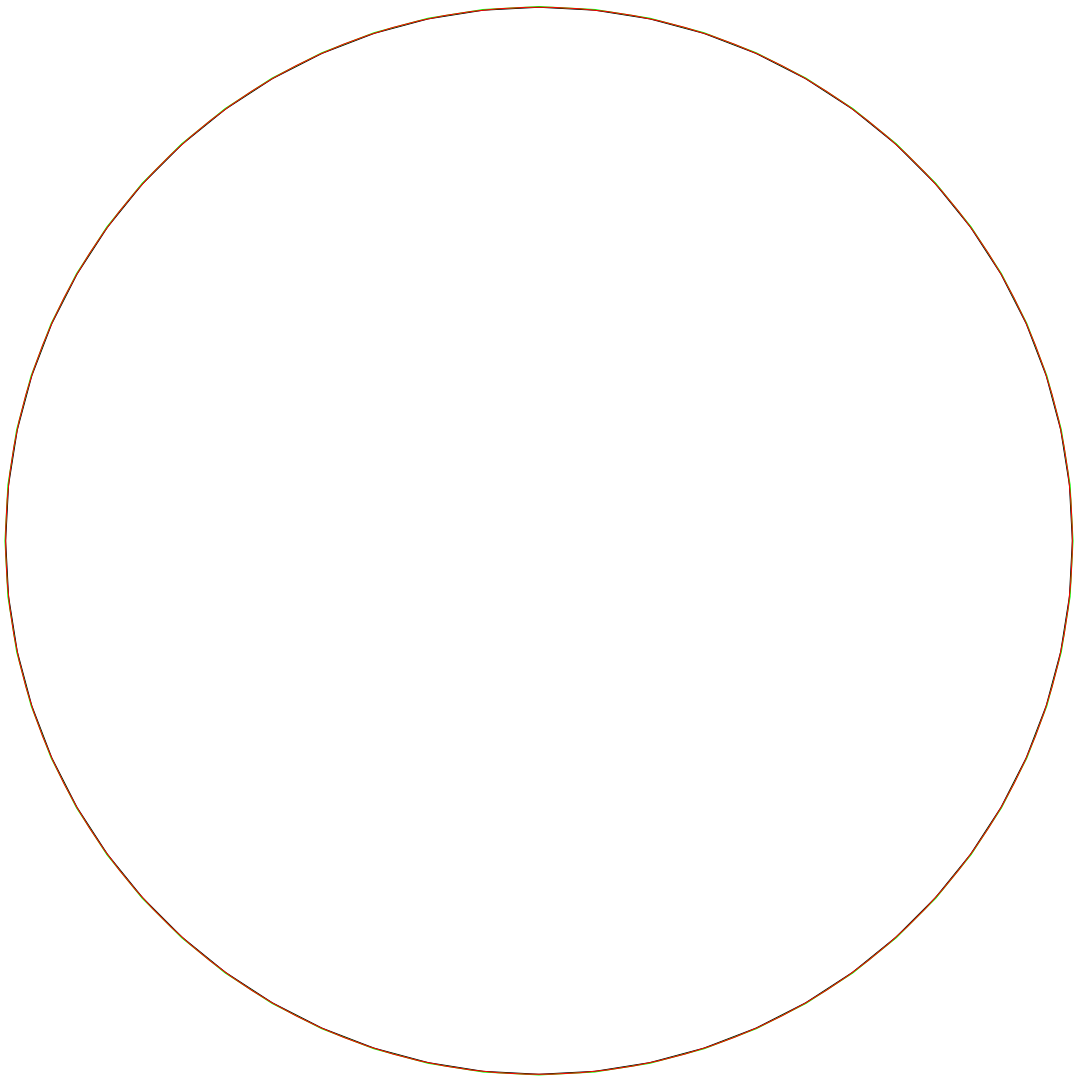
n-gon = 54

3.13982 < Pi < 3.14514



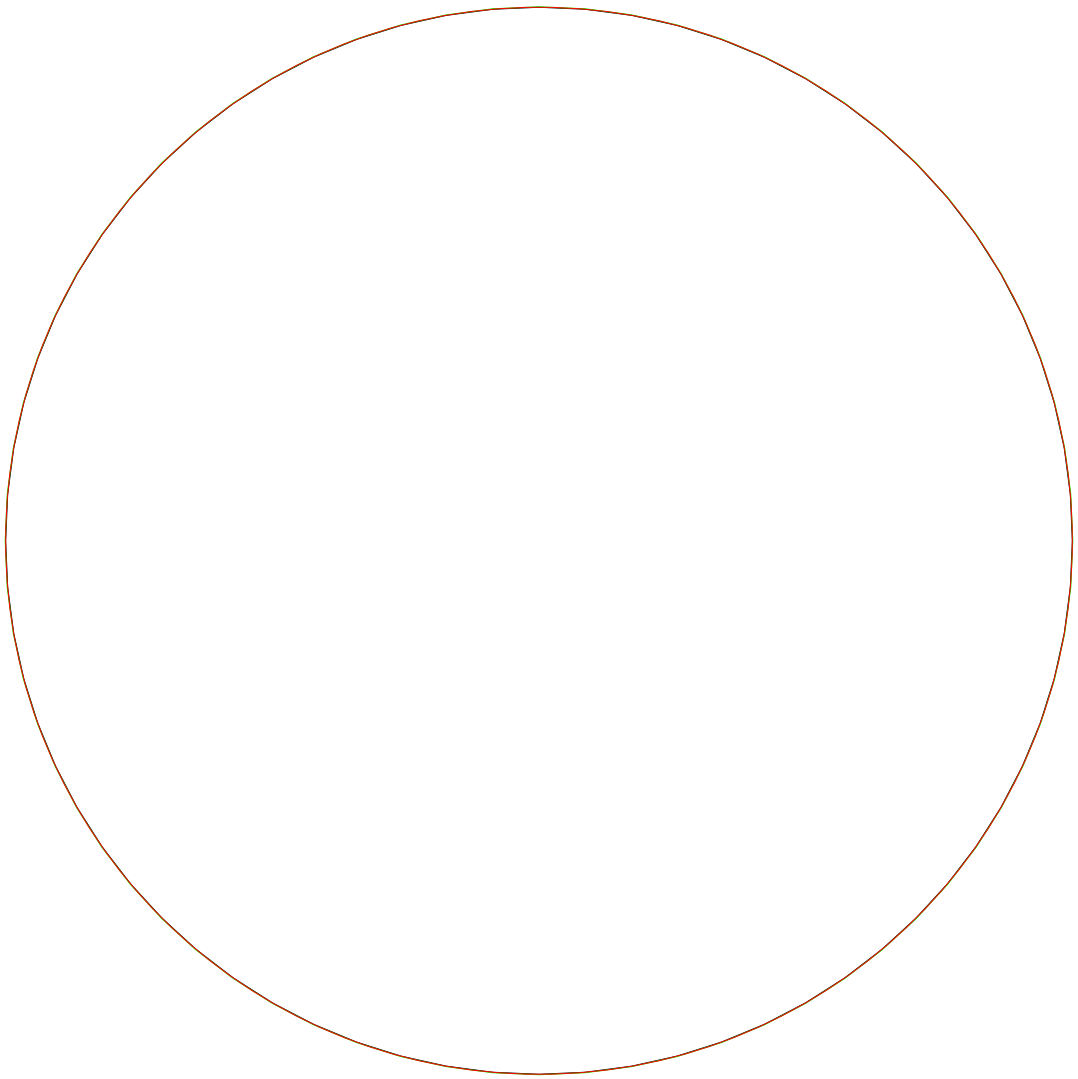
n-gon = 60

3.14016 < Pi < 3.14447



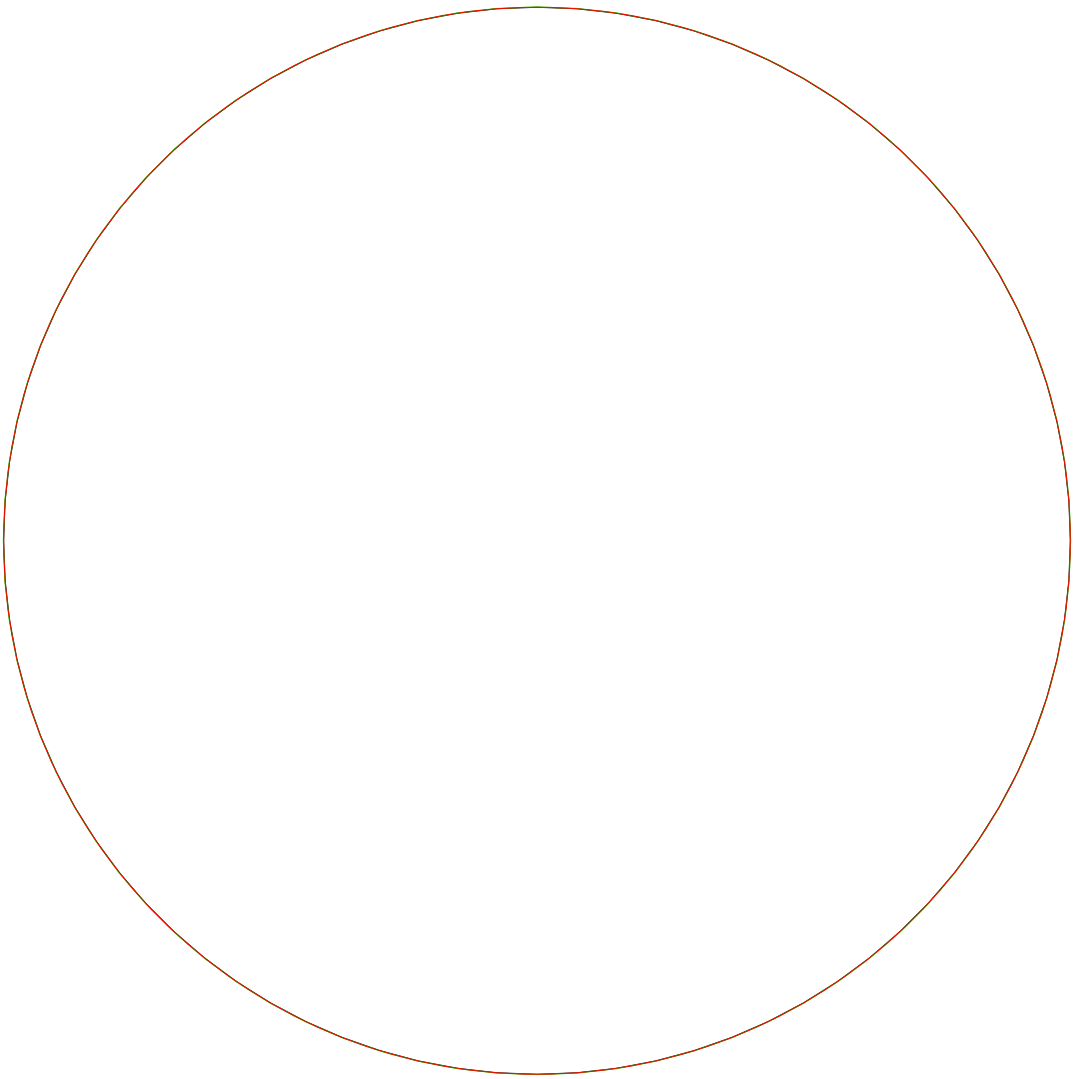
n-gon = 72

3.1406 < Pi < 3.14359



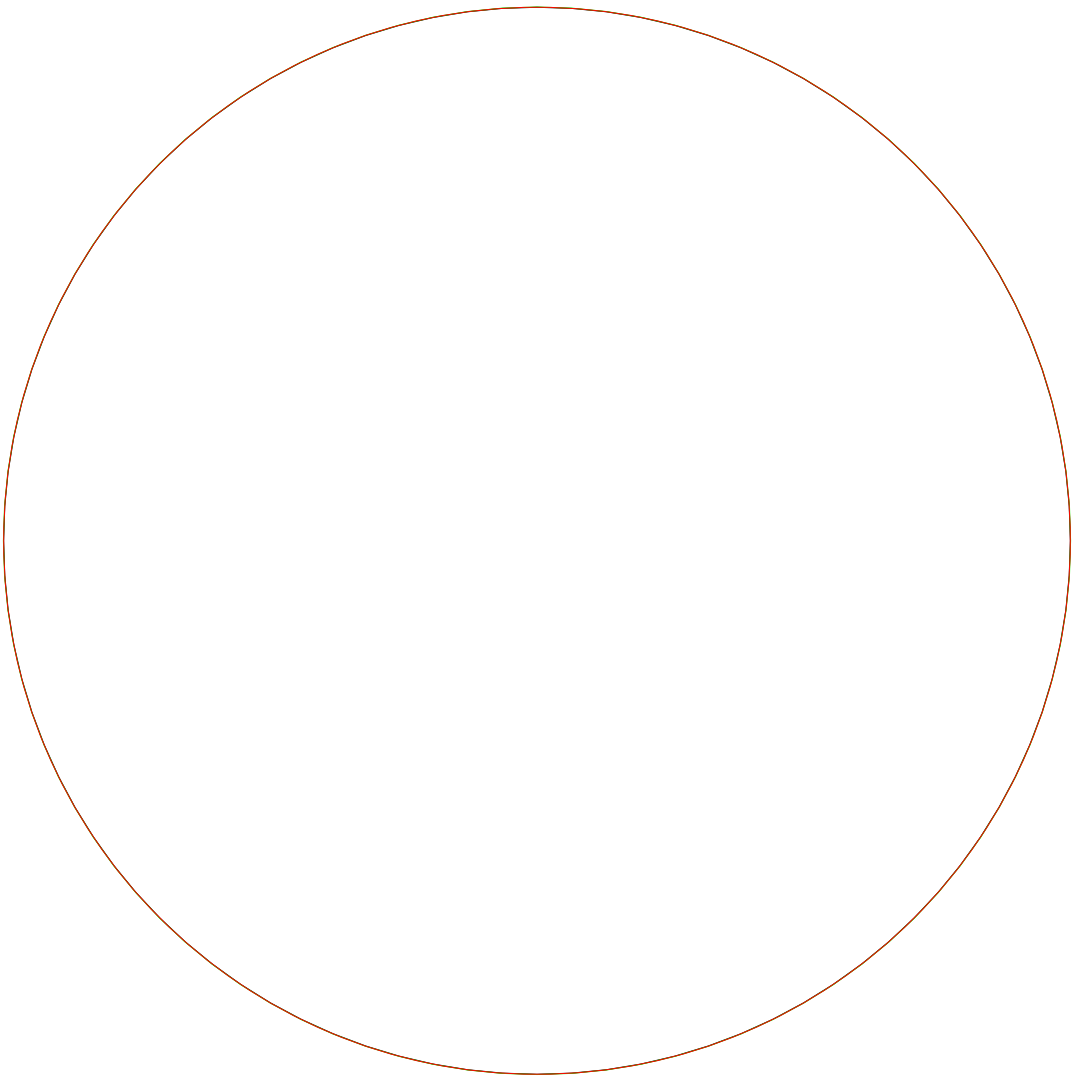
n-gon = 84

3.14086 < Pi < 3.14306



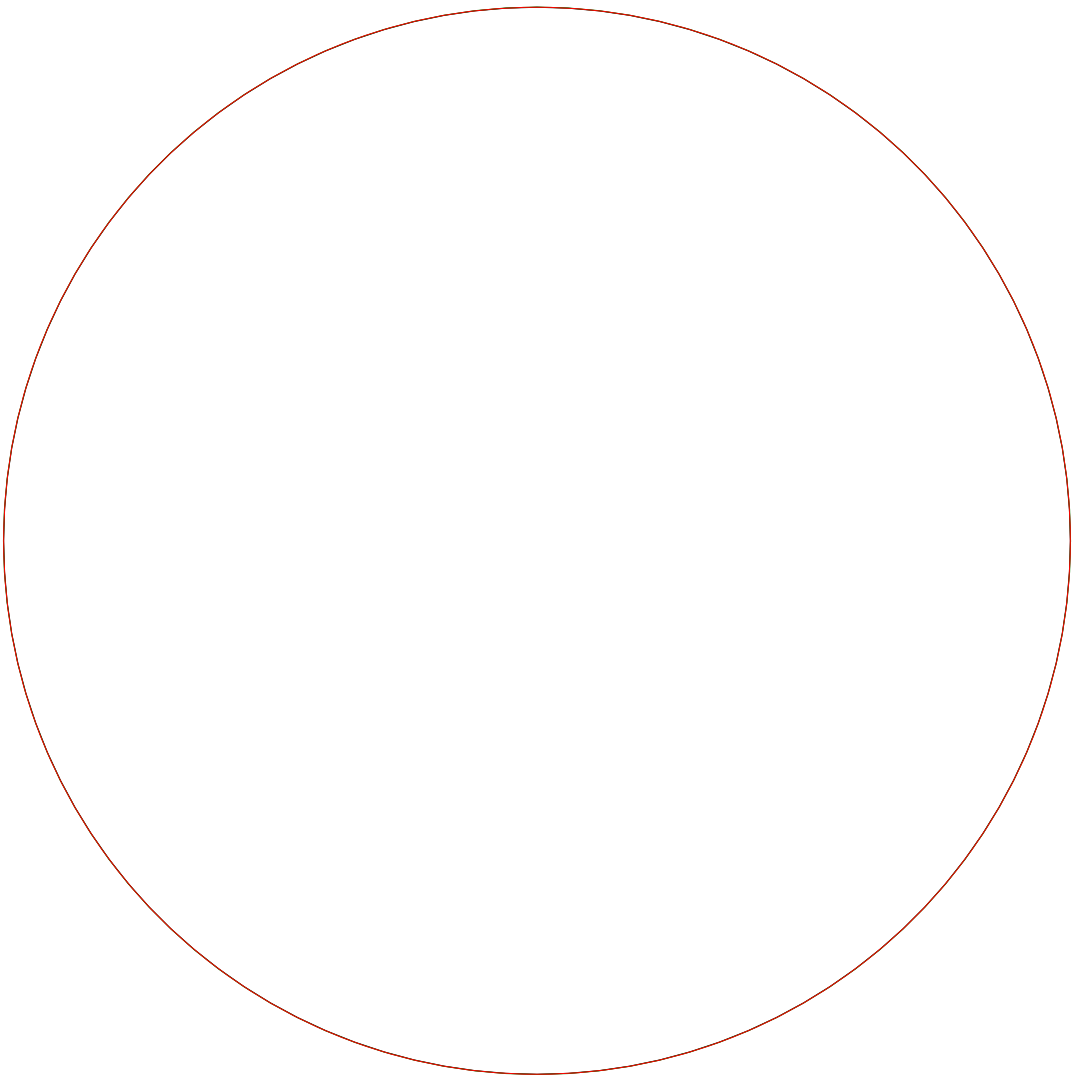
n-gon = 96

3.14103 < Pi < 3.14271



n-gon = 108

3.14115 < Pi < 3.14248

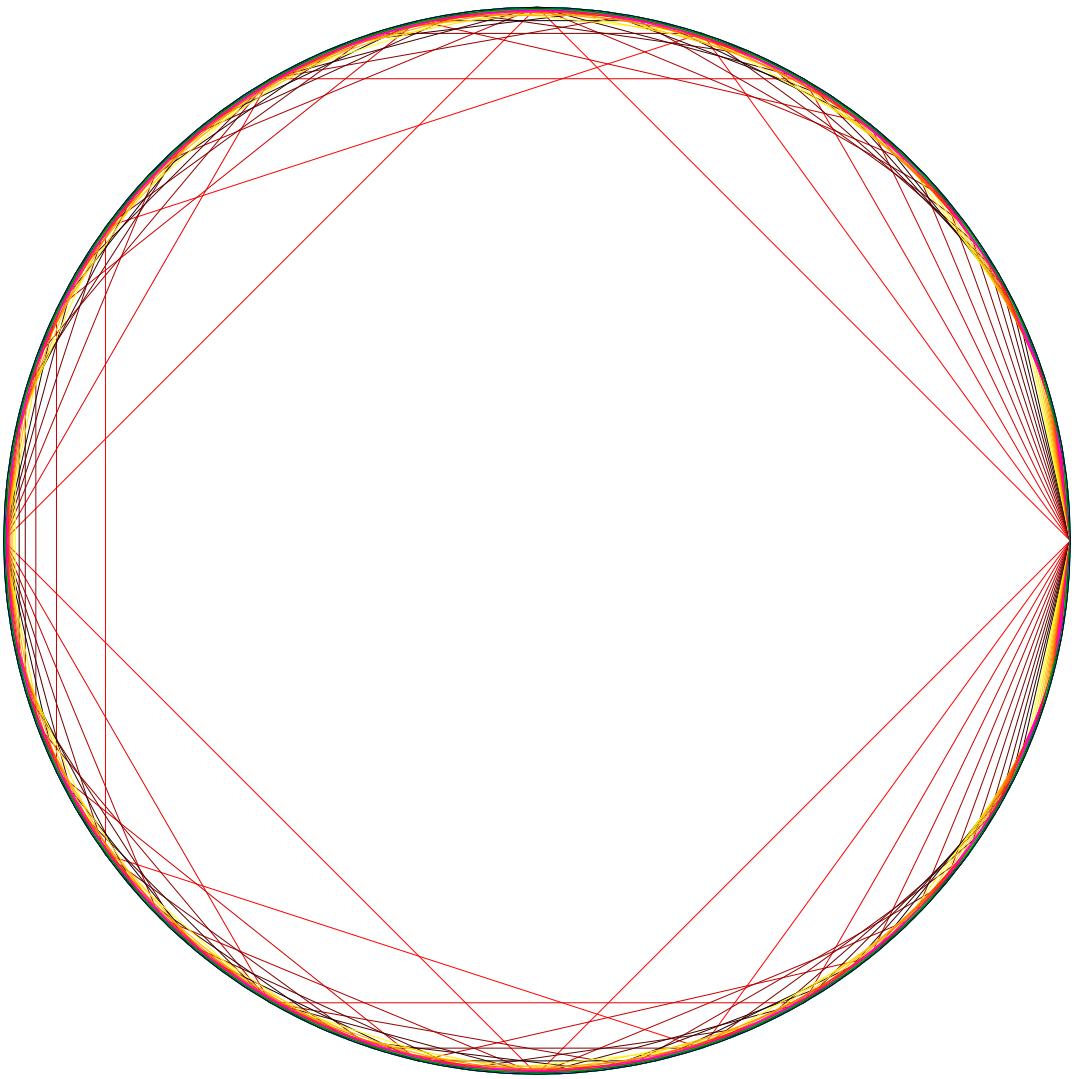


For Reality, PI = 3.141592654

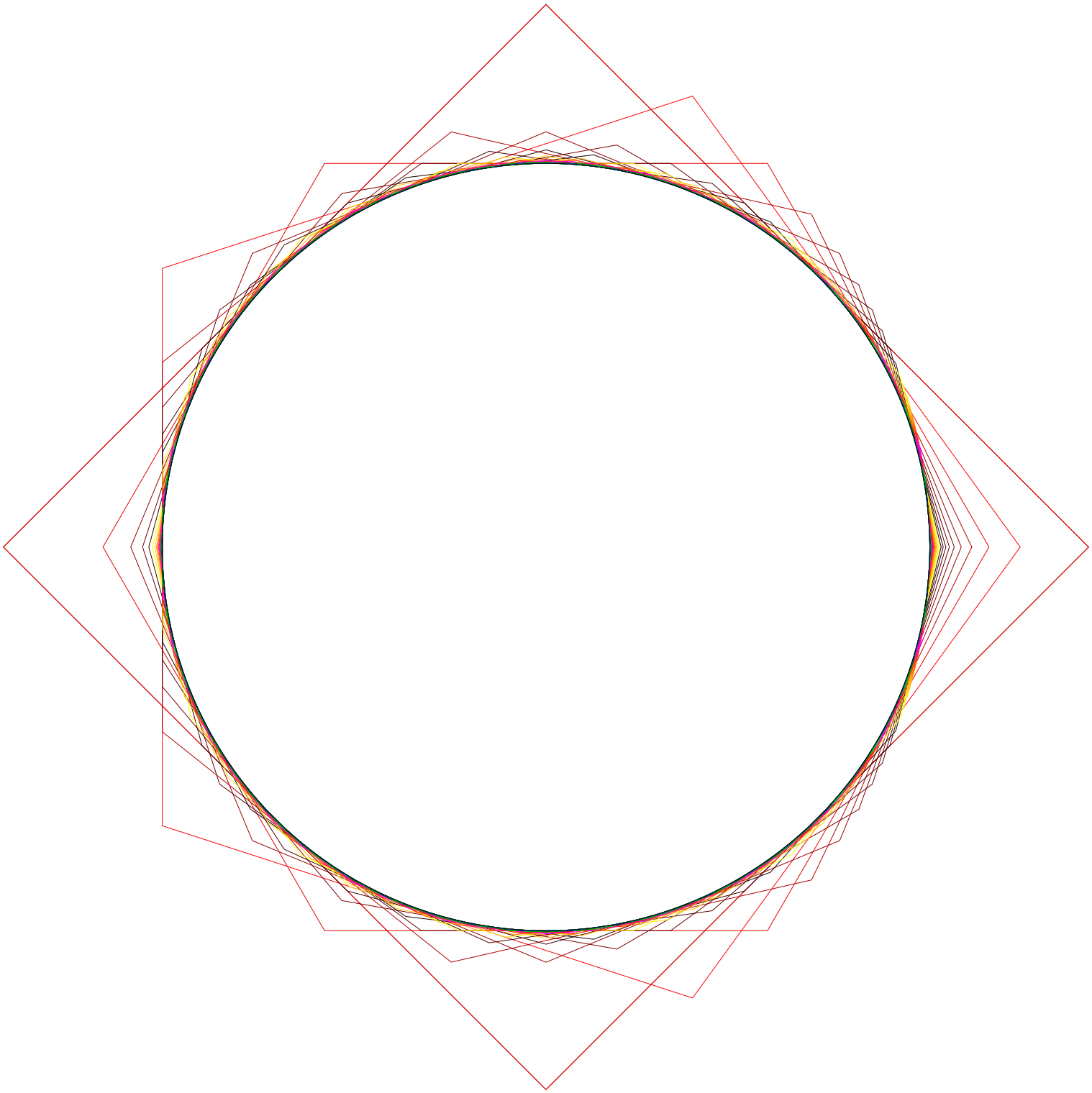
And we obtain 3.14115 < PI < 3.14248

where when n becomes larger, it’ll be closer to PI

Here’s the conclusion graph (for Inscribe n-gon)



Here’s the conclusion graph (for Outscribe n-gon)



MATH 308

--Project End--

Thank you

for viewing