$\zeta(4), \zeta(6).......\zeta(80), \zeta(82)$ are irrational number

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Abstract

$\zeta(4), \zeta(6).......\zeta(80), \zeta(82)$ considered.

From these equations, it can be said that $\zeta(4), \zeta(6).......\zeta(80), \zeta(82)$ are irrational numbers.

$\zeta(84), \zeta(86)$ etc. can also be expressed by these equations.

Because I use π^2, these are to be irrational numbers.

The fact that the even value of $\zeta(2n)$ is irrational can also be explained by the fact that each even value of $\zeta(2n)$ is multiplied by π^2.

key words
irrational number, π^2, $\zeta(4), \zeta(6).......\zeta(80), \zeta(82)$

1 introduction

(Proof)
If π is assumed to be rational number. $\pi = \frac{m}{n}$, m and n are integer.

Equal $n\pi = m$

Square on both sides.

$n^2\pi^2{=}m^2$, it equal $\pi^2 = \frac{m^2}{n^2}$. it equal $\pi = \frac{m}{n}$

But, $\pi \neq \frac{m}{n}$.

This is because π is known to be an irrational number.
This contradicts.

π^2 is irrational number.
(proof end)

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and
(Proof)
If π^2 is assumed to be rational number. $\pi^2 = \frac{m}{n}$, m and n are integer.

Equal $n\pi^2 = m$

Square on both sides.

$n^2\pi^4$=m^2, it equal $\pi^4 = \frac{m^2}{n^2}$. it equal $\pi^2 = \frac{m}{n}$

But, $\pi^2 \neq \frac{m}{n}$.

This is because π^2 is an irrational number.
This contradicts.

π^4 is irrational number.
(proof end)

and
(Proof)
If π^2 is assumed to be rational number. $\pi^2 = \frac{m}{n}$, m and n are integer.

Equal $n\pi^2 = m$

To the third power on both sides.

$n^3\pi^6$=m^3, it equal $\pi^6 = \frac{m^3}{n^3}$. it equal $\pi^2 = \frac{m}{n}$

But, $\pi^2 \neq \frac{m}{n}$.

This is because π^2 is an irrational number.
This contradicts.

π^6 is irrational number.
(proof end)

Do the same for π^8, π^{10}, etc.

and
(irrational number)×(rational number)=(irrational number)

(Proof)
if $\pi \times \frac{s}{t} = \frac{m}{n}$ s and t, m and n are integer.

equal $\pi = \frac{t}{s} \times \frac{m}{n} = \frac{tm}{sn}$

But, $\pi \neq \frac{tm}{sn}$.

This is because π is known to be an irrational number.
This contradicts.

$\pi \times \frac{s}{t}$ is irrational number.

2 Discussion

The following formula is given using the formula for an even value of ζ using Bernoulli numbers.

$$\zeta(2) = \pi^2 \times \frac{1}{6} \tag{1}$$

$$\zeta(4) = \pi^4 \times \frac{1}{90} \tag{2}$$

$$\zeta(6) = \pi^6 \times \frac{1}{945} \tag{3}$$

$$\zeta(8) = \pi^8 \times \frac{1}{9450} \tag{4}$$

$$\zeta(10) = \pi^{10} \times \frac{1}{93555} \tag{5}$$

$$\zeta(12) = \pi^{12} \times \frac{691}{638512875} \tag{6}$$

$$\zeta(14) = \pi^{14} \times \frac{2}{18243225} \tag{7}$$

$$\zeta(16) = \pi^{16} \times \frac{43867}{38979295480125} \tag{8}$$

$$\zeta(18) = \pi^{18} \times \frac{43867}{38979295480125} \tag{9}$$

$$\zeta(20) = \pi^{20} \times \frac{174611}{1531329465290625} \tag{10}$$

$$\zeta(22) = \pi^{22} \times \frac{155366}{13447856940643125} \tag{11}$$

$$\zeta(24) = \pi^{24} \times \frac{236364091}{201919571963756521875} \tag{12}$$

$$\zeta(26) = \pi^{26} \times \frac{1315862}{11094481976030578125} \tag{13}$$

$$\zeta(28) = \pi^{28} \times \frac{6785560294}{564653660170076273671875} \tag{14}$$

$$\zeta(30) = \pi^{30} \times \frac{6892673020804}{5660878804669082674070015625} \tag{15}$$

$$\zeta(32) = \pi^{32} \times \frac{7709321041217}{62490220571022341207266406250} \tag{16}$$

$$\zeta(34) = \pi^{34} \times \frac{151628697551}{12130454581433748587292890625} \tag{17}$$

$$\zeta(36) = \pi^{36} \times \frac{26315271553053477373}{20777977561866588586487628662044921875} \tag{18}$$

$$\zeta(38) = \pi^{38} \times \frac{308420411983322}{2403467618492375776343276883984375} \tag{19}$$

$$\zeta(40) = \pi^{40} \times \frac{261082718496449122051}{20080431172289638826798401128390556640625} \tag{20}$$

$$\zeta(42) = \pi^{42} \times \frac{261082718496449122051}{20080431172289638826798401128390556640625} \tag{21}$$

$$\zeta(44) = \pi^{44} \times \frac{5060594468963822588186}{37913679547025773526706908457776679169921875} \tag{22}$$

$$\zeta(46) = \pi^{46} \times \frac{103730628103289071874428}{7670102214448301053033358480610212529462890625} \tag{23}$$

$$\zeta(48) = \pi^{48} \times \frac{5609403368997817686249127547}{4093648603384274996519698921478879580162286669921875} \tag{24}$$

$$\zeta(50) = \pi^{50} \times \frac{39604576419286371856998202}{285258771457546764463363635252374414183254365234375} \tag{25}$$

$$\zeta(52) = \pi^{52} \times \frac{123256264328536916515065383362}{8761982491474419367550817114626909562924278968505859375} \tag{26}$$

$$\zeta(54) = \pi^{54} \times \frac{116599854539539449685672495250764}{81807125729900063867074959072425603825198823017351806640625} \tag{27}$$

$$\zeta(56) = \pi^{56} \times \frac{708397979803779072481547354189494}{4905352087939496310826487207538302184255342959123162841796875} \tag{28}$$

$$\zeta(58) = \pi^{58} \times \frac{11652912186052419567178865654349796}{796392368980577121745974726570063253238310542073919837646484375} \tag{29}$$

$$\zeta(60) = \pi^{60} \times \frac{4860932561935022288161219976319280984165964}{3278777586273629598615520165380455583231003564645636125000418914794921875} \tag{30}$$

$$\zeta(62) = \pi^{62} \times \frac{3174344628151447365665300608362164168}{21132271510899613925529439369536628424678570233931462891949462890625} \tag{31}$$

$$\zeta(64) = \pi^{64} \times \frac{106783830147866529886385444979142647942017}{7016125464333780819415029165079856003277532103367584994756141174316406250} \tag{32}$$

$$\zeta(66) = \pi^{66} \times \frac{1338727292842123321865108571410847583856271 91}{868127902931462133606519666042629371054951415635888068882042735013732910 15625} \tag{33}$$

$$\zeta(68) = \pi^{68} \times \frac{125235502160125163977598011460214000388469}{80152819642824269512101026745584380406282235789783185812510240768432617 1875} \tag{34}$$

$$\zeta(70) = \pi^{70} \times \frac{860217912761924002173186609930204119149393234 42}{5433748964547053581149916185708338218048392402830337634114958370880742156 982421875} \tag{35}$$

$$\zeta(72) = \pi^{72} \times \tag{36}$$

$$\frac{5827954961669944110438277244641067365282488301844260429}{36333482052698792308568400043048215369680497801128036508177714325585607934584526062011 71875} \tag{37}$$

$$\zeta(74) = \pi^{74} \times \tag{38}$$

$$\frac{1846076610228171244017841823322845145226395015302}{11359005221796317918049302062760294302183889391189419445133951612582060536346435546875} \tag{39}$$

$$\zeta(76) = \pi^{76} \times \tag{40}$$

$$\frac{2595272507993197127124968004272126305722659771459558}{1576061974524239111129340661207990834428014653027531948012335786245760899418067932128906 25} \tag{41}$$

$$\zeta(78) = \pi^{78} \times \tag{42}$$

$$\frac{1276450355616617933215935493998590995360613462684309179 96}{765057362284269531737382383521831018016883928122444851812771279301090491382576557044982910 15625} \tag{43}$$

$$\zeta(80) = \pi^{80} \times \tag{44}$$

$$\frac{460378429947945764693557496901904684979425787275128891965686 7}{2723358298436979589207022841000157835598601357139007172322525934972106798806885286329660415649414 0625} \tag{45}$$

$$\zeta(82) = \pi^{82} \times \tag{46}$$

$$\frac{818055682529339432596660736481107268394017574424513860917 86}{4776089171877348057451105924101750653118402745283825543113171217116857704024700607798175811767578 125} \tag{47}$$

(48)

$\zeta(84), \zeta(86)$ etc. can also be expressed by these equations

3 Conclusion

The fact that the even value of $\zeta(2n)$ is irrational can also be explained by the fact that each even value of $\zeta(2n)$ is multiplied by π^2.

4 Appendices

I use WolframAlpha for calculation.

References

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