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Question: The infinite series $f(n) = \sum_{k=1}^n \frac{1}{k^4}$ converges on a value $f(n) = \pi^4/90$ as n approach...

3. The infinite series

$$f(n) = \sum_{k=1}^n \frac{1}{k^4}$$

converges on a value $f(n) = \pi^4/90$ as n approaches infinity. Write a program to calculate $f(n)$ for $n = 10,000$ by computing the sum from $k=1$ to $10,000$. Then repeat the calculations but in reverse order - that is, from $k=10,000$ to 1 using increments of -1 . In each case, compute the true percent relative error after each term is added. Compare the final error in the end of the calculations for the two cases. Explain the results.

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Expert Answer



Anonymous

answered this

```
format long
approx = 0;
for k =1:10000
    approx = approx + (1.0/(k^4));
end
approx
truevalue = ((pi)^4 )/90
relerror = abs(truevalue - approx)/truevalue;
fprintf("Relative error is: ");
disp(relerror);
```

```

approx = 0;
k = 10000;
while (k>=1)
approx = approx + (1.0/(k^4));
k = k-1;
end
approx
releror = abs(truevalue - approx)/truevalue;
fprintf("Relative error is: ");
disp(releror);
=====
=====

```

See Output

```

1 format long
2 approx = 0;
3 for k = 1:10000
4     approx = approx + (1.0/(k^4));
5 end
6 approx
7 truevalue = ((pi)^4)/90
8 releror = abs(truevalue - approx)/truevalue;
9 fprintf("Relative error is: ");
10 disp(releror);
11
12 approx = 0;
13 k = 10000;
14 while (k>=1)

```

```

sh-4.4$ octave -qf --no-window-system demo.m
warning: function ./demo.m shadows a core library function
approx = 1.0823232371086
truevalue = 1.0823232371114
Relative error is: 2.55828955451781e-13
approx = 1.0823232371086
Relative error is: 3.07733306477683e-13
sh-4.4$

```

Thanks, let me know if there is any concern.

3 Comments

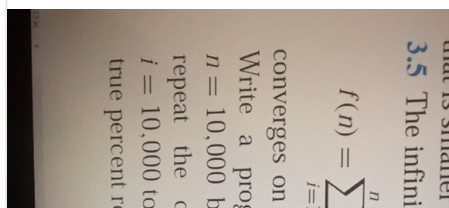
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write a matlab code for the following infinite series:

[See answer](#)

The infinite series $f(n) = \sum_{k=1}^n \frac{1}{k^4}$ converges on a value $f(n) = \pi^4/90$ as n approaches infinity. Write a program to calculate $f(n)$ for $n = 10,000$ by computing the Sum from $k = 1$ to $k = 10,000$. Then repeat the calculations but in reverse order - that is, from $k = 10,000$ to 1 using increments of -1 . In each case, compute the true percent relative error after each term...

[See answer](#)

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