Question: You are given a toy calculator that has only one function of multiplying two numbers, both are re...

You are given a toy calculator that has only one function of multiplying two numbers, both are restricted to be between 0.000 and 0.999 with only a 3-digit accuracy. Moreover, after performing the calculation, the machine will retain only 3 digits (to the right of the floating point) as its outcome.

So i understand what i am being asked and have the "true values" and "rounded values" recorded as strings but i am bit lost on how to format them in MATLAB so that i can plot the true percent relative error. Would appreciate thorough code on how to tackle this problem! Thank you!

1. You are given a toy calculator that has only one function of multiplying two numbers, both are restricted to be between 0.000 and 0.999 with only a 3-digit accuracy. Moreover, after performing the calculation, the machine will retain only 3 digits (to the right of the floating point) as its outcome. For instance, given A = 0.318, the precise value of $A \times A$ should be 0.101124 while the calculator will produce 0.101. For the calculation of $A \times A \times A$, the process will unfold as the following

$$A = 0.318$$

$$A \times A = 0.101124 \Rightarrow \text{ calculator retains } \underline{0.101}$$

$$A \times A \times A = (A \times A) \times A = 0.101 \times 0.318 = 0.032118 \Rightarrow \text{ calculator retains } \underline{0.032} \text{ as final answer}$$

The underlined numbers are those that have been trimmed by the calculator. Note that the exact value of $A \times A \times A$ is 0.032157432.

Using this toy calculator, **and given A = 0.629**, evaluate A^2, A^3, A^4, ..., to A^{10}. Compare the results with those evaluated by using a real calculator (or MATLAB). Treat the latter as the "true" values to evaluate the "true percent relative error" produced by the toy calculator. Plot the error as a function of N, the exponent of A (e.g., $N = 4$ for A^4).

Note: consider two cases of round-off – chopping and rounding. Compare the two cases (i.e. plot the error as a function of N for two cases on the same plot). Discuss your results.

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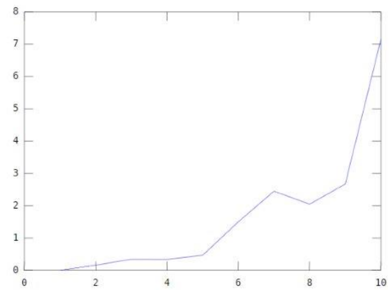
Expert Answer

Anonymous
answered this

```
octave:1> A=0.629;
octave:2> %CALCULATING TRUE VALUES
octave:2> B=zeros(1,10);
octave:3> for i=1:10;
> > B(i)=A^i;
> > end
octave:4> %CALCULATING APPROX VALUES
octave:4> C=zeros(1,10);
octave:5> for i=1:10;
> > C(i)=A^i;
> > C(i)=floor(C(i)*1000)/1000;
> > end
octave:6> %CALCULATING TRUE PERCENT RELATIVE ERROR
octave:6> D=zeros(1,10);
octave:7> for i=1:10;
> > D(i)=(B(i)-C(i))*100/B(i);
> > end
octave:8> %SET VALUES OF N
octave:8> for i=1:10;
> > N(i)=i;
> > end
octave:9> %CHECK RESULTS
```

```
octave:9> plot (N,D)
```




```
octave:10> disp(B)
 Columns 1 through 6:

   0.6290000   0.3956410   0.2488582   0.1565318   0.0984585   0.0619304

 Columns 7 through 10:

   0.0389542   0.0245022   0.0154119   0.0096941
octave:11> disp(C)
 Columns 1 through 6:

   0.6290000   0.3950000   0.2480000   0.1560000   0.0980000   0.0610000

 Columns 7 through 10:

   0.0380000   0.0240000   0.0150000   0.0090000
octave:12> disp(D)
 Columns 1 through 8:

   0.00000   0.16202   0.34485   0.33974   0.46568   1.50233   2.44959   2.04963

 Columns 9 and 10:

   2.67253   7.15980
```

What we did above is called chopping. If you want to round off the results, use:

for i=1:10;

E(i)=round (B(i),3);

end

You will get the systematically rounded B matrix up to 3 digits after decimal point. Then plot (N,E) to get the graph.

Best of luck!

0 Comments

Was this answer helpful? 2 0

Up next for you in Mechanical Engineering

The beam with length L,

SPLEASE ANSWER FOR

elastic modulus E, Poisson's ratio, v is loaded as shown below in Fig. …

Q4) The beam with length L, elastic modulus E, Poisson's ratio, v is loaded as shown below in Fig. 4. *(7x5=35 marks)*

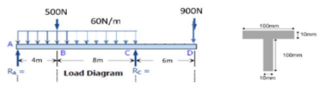
a) Draw the shear force and bending moment diagrams
b) Derive an expression for the moment of inertia for the cross section shown
c) Determine the position X_0 where maximum normal and shear stresses would be observed
d) Find an expression for the maximum shear stress value.
e) Find an expression for the maximum normal stress value.
f) Find an expression for the slope of the beam as a function of the distance from point A.
g) Find an expression for the deflection of the beam as a function of the distance from point A.

See answer

SITUATION 2 (SITUATION 1 HAS BEEN SOLVED)

1) Draw shear force diagram and bending moment diagram
2) Determine the maximum bending moment, hence maximum stress in compression and tension.
3) Determine the maximum shear stress and maximum transverse shear stress
4) Draw the normal stress distribution and transverse shear stress distribution on the beam cross section at the maximum location of bending moment.
5) Write and draw the curve equation and determine the highest deflection.

Situation 1



See answer

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Questions viewed by other students

The Taylor Series Expansion for sin(x) is given by sin(x)= x-(x^3)/3! + (x^5)/5! - (x^7)/7! + (x^9)/9! .... where x is the angle in radians. Calculate approximations for sin (x) using

See answer

The infinite series f(n) = sigma^n_k = 1 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...

See answer