**Problem #1:**

Plot the deflection of the beam, *y*, as a function of distance from the pinned end, *x*. Copy and paste both your plot and your Matlab code into your Word document for the homework submission.



**Answer #1:** The maximum deflection of the beam is 1 cm bellowed the pinned joint.

%% Problem #1

% Plot the deflection, y, of the beam as a function of distance,x

% Initialize constants

E = 70.0\*10^9;

L = 6.0;

I = 9.19\*10^(-6);

Wo = 800;

% split equation into two parts

x = linspace(0,6,100);

y = (-Wo.\*x./(360\*(E\*I\*L))).\*(3.\*x.^3-10\*L^2.\*x.^2+7\*L^4);

plot(x,y); xlabel('Distance(m)'); ylabel('Displacement(m)'); title('Deflection of a Beam');

%Max Deflection of Beam is -0.01 meters.

**Problem #2:**

Use Matlab to show that the Euler series given below approaches /4.

Create several arrays of different sizes to evaluate the summation for 10, 50, 100 & 200 terms and calculate the percent error for each case.

Create a simple table in your Word document to summarize the results (number of terms and percent error) and copy & paste your Matlab code into your Word document.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| Number of Terms | 10 | 50 | 100 | 200 |
| Percent Error | 5.79% | 1.20% | 0.605% | 0.303% |

%% Problem #2

% Show the given Euler series approaches pi/4

% Sets the value to approach and sets up arrays with different number of terms

truevalue = pi^2/6;

i10 = [1:10];

i50 = [1:50];

i100 = [1:100];

i200 = [1:200];

%Uses the equation in the summation to solve for each value individually

multi10 = 1./(i10.^2);

multi50 = 1./(i50.^2);

multi100 = 1./(i100.^2);

multi200 = 1./(i200.^2);

%Adds up all value calculated to arrive at the total sum.

sum10 = sum(multi10);

sum50 = sum(multi50);

sum100 = sum(multi100);

sum200 = sum(multi200);

%Calculates percent error.

error10 = (truevalue-sum10)/truevalue\*100;

error50 = (truevalue-sum50)/truevalue\*100;

error100 = (truevalue-sum100)/truevalue\*100;

error200 = (truevalue-sum200)/truevalue\*100;

numterms = [10,50,100,200;error10,error50,error100,error200]

**Problem #3:**

Consider three geometrical shapes with a defining parameter, *a*: a sphere whose radius is *a*, a right equilateral triangular prism where both the sides of the base and the height are *a*, and a cube where each side has a length of *a*. For 10 uniformly-spaced values of *a* from *a* = 1 to *a* = 2, calculate the volume of each shape: *Vs*, *Vp*, *Vc*. Plot each volume vs. *a*, with all three curves on the same graph. Make sure that your graph is presentable, with all required elements.

Copy and paste your plot and your Matlab code into your Word document.

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%% Problem #3

%Plot the variation of volume versus the variable a

%A controls the change in volume for all three shapes

close all; clear all; clc

a = linspace(1,2,10);

vs = 4/3.\*a.^3;

vt = 1/2.\*a.^3;

vc = a.^3;

y = linspace(1,2,10);

figure(1); plot(a,vs,a,vc,a,vt);hold on;

xlabel('a');ylabel('Volume'); title('Volume vs. change in a for geometric shapes');

legend('Volume of Cube', 'Volume of a sphere', 'Volume of a triangular prism','Location','North')