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DO ANY 3 PROBLEMS

Check the 3 problems you want graded:

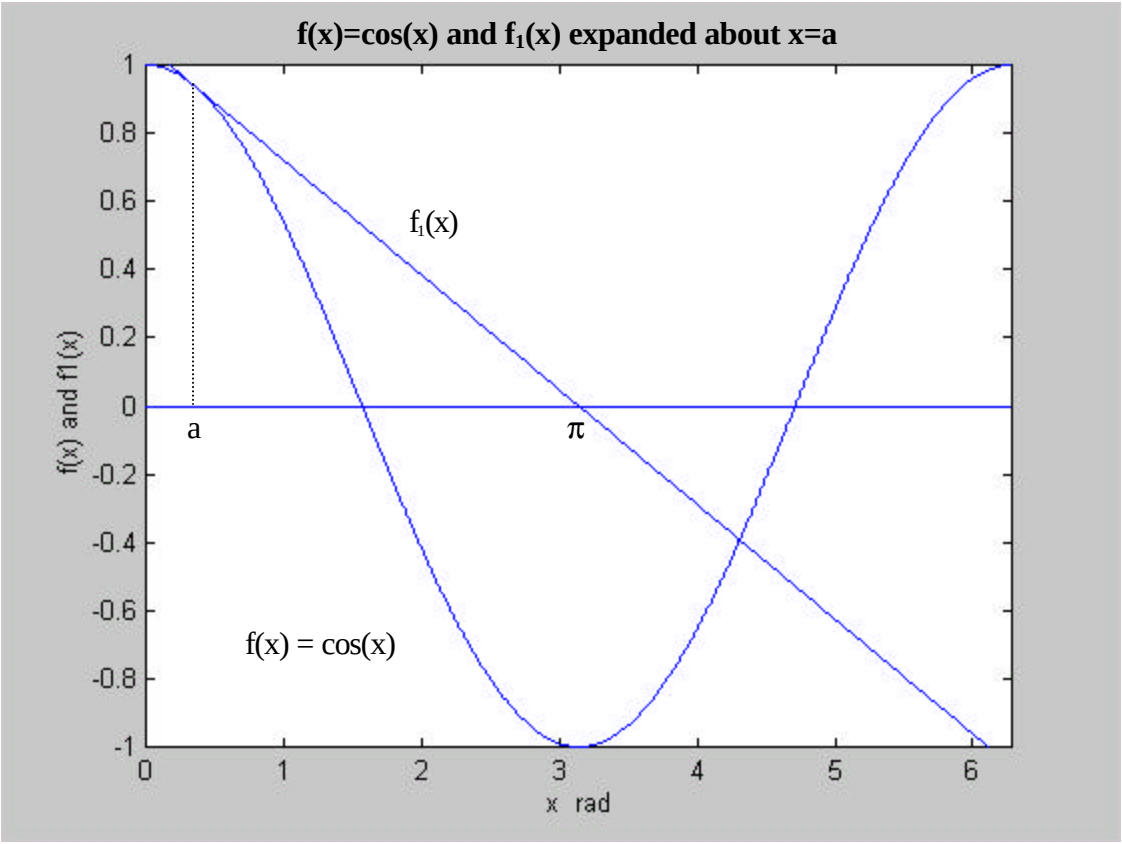
1.ÿ 2.ÿ 3.ÿ 4.ÿ

Problem 1 (45 pts)

The function f(x) = cos(x) is expanded in a 1st order truncated series about the pt x=a.

$$f_1(x) = f(a) + f'(a)(x-a)$$

The point "a" is chosen so that $f_1(\pi) = 0$. (see graph)



a) Show that "a" is a root of $f(a) = (\pi - a)\tan(a) - 1 = 0$. Hint: $\tan(a) = \dfrac{\sin(a)}{\cos(a)}$

b) Try to find the root by doing 5 iterations of the Simple One Point Iteration Method starting with an initial guess of $a_0 = 1$. Use the table below to enter your results (4 places after the decimal point). Be sure to show how you found g(a) and comment on whether the method appears to be converging.

i	a_i	$a_{i+1}=g(a_i)$
0	1	
1		
2		
3		
4		
5		

c) Try to find the root by doing 3 iterations of the Newton-Raphson Method starting with an initial guess of $a_0 = 1$. Use the table below to enter your results (4 places after the decimal point). Is the method converging?

Hint: $\dfrac{d}{da}\tan(a) = \sec^2(a) = 1 + \tan^2(a)$

i	a_i	$f(a_i)$	$f'(a_i)$	a_{i+1}
0	1			
1				
2				
3				

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Problem 2 (30 pts)

The function $f(x) = x^3 - 6.75x^2 + 13.25x - 7.5$ has a root located between 3 and 5. Fill in the tables below for the first three iterations of the Bisection Method and the False Position method. Express all answers to four digits after the decimal point.

Iteration	x_l	x_u	x_r	$f(x_l)$	$f(x_r)$	$\|e_A\|$, %
1	3	5				
2						
3						

Bisection Method

Iteration	x_l	x_u	x_r	$f(x_l)$	$f(x_u)$	$f(x_r)$	$\|e_A\|$, %
1	3	5					
2							
3							

False Position Method

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Problem 3 (25 pts)

Solve the system of equations below by finding the inverse of the coefficient matrix. You must show sufficient work in the process of finding the inverse to receive full credit, i.e. the complete cofactor matrix must be shown or the entire set or row equivalent matrices if the Gauss-Jordan Method is used.

$$
\begin{array}{rcrcrcr}
x & + & 2y & + & 3z & = & 6 \\
2x & - & 3y & - & z & = & -2 \\
5x & + & 4y & - & 6z & = & 3
\end{array}
$$

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Problem 4 (40 pts)

Given the following system of equations

$$\begin{aligned} x_1 + x_2 + x_3 + Kx_4 &= 2 \\ -x_1 + x_3 - x_4 &= 1 \\ 2x_1 - x_2 + 3x_3 - 8x_4 &= 2 \\ x_2 + x_3 - 2x_4 &= 2 \end{aligned}$$

1. Convert the augmented matrix into its echelon form and find the value of K which results in an infinite number of solutions.
2. For the case when infinite solutions exist, determine whether x_2 can be arbitrary **without finding the solution.**

Note: You may come and check with me to see if you obtained the correct answer to Part 1. If your answer is incorrect, I will give you the correct answer and there will be a penalty of 10 pts.

3. Show that x_4 is arbitrary and find the solution with x_4 as the arbitrary unknown.