Su 95
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SHOW ALL WORK

Problem 1 (30 pts)

A) Find $f_2(x)$, the second order truncated Taylor Series Expansion of the function

$$f(x) = e^{-x} \sin x$$

about the point x_0. Leave your answer in terms of x and x_0.

B) If $x_0 = \pi/2$, then the quadratic function $f_2(x)$ can be expressed as

$$f_2(x) = a_0 + a_1 x + a_2 x^2$$

where $a_0, a_1,$ and a_2 are constants. Find $a_0, a_1,$ and a_2 and leave your answers in terms of π.

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Problem 2 (35 pts)

A cantilevered beam extending from its clamped end (x=0) to its free end (x=L) has a maximum deflection δ_{max} at the end of the beam, i.e. at x=L. The deflection δ at location $x=\alpha L$ ($0<\alpha<1$) is related to δ_{max} by the equation

$$f(\alpha) = \alpha^4 - 4\alpha^3 + 6\alpha^2 - 3\delta / \delta_{max} = 0$$

Use the Bisection Method to solve for the value of α at which δ/δ_{max} is equal to 0.75. Start with an initial bracket of $\alpha_L = 0.5$ and $\alpha_U = 1.0$. Complete 3 iterations and fill in the table below. Round all answers to 5 places after the decimal point.

i	α_L	α_U	α_R	$\lvert e_A \rvert$
0	0.50000	1.00000		
1				
2				
3				

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Problem 3 (30 pts)

Use the Newton-Raphson Method to find the value of x where the linear function $y = x + \frac{1}{2}$ and the trigonometric function y=cos(x) are equal. Start with an initial guess of $x_0 = 0$. Fill in the table below and round the answers for x_i and x_{i+1} to 4 places after the decimal point. Use the rounded answers for x_i to calculate x_{i+1}. Stop when there is no change in x_i (rounded to 4 places after the decimal point).

i	x_i	$f(x_i)$	$f'(x_i)$	x_{i+1}
0				
1				
2				
3				
4				
5				
6				