ASSIGNMENT 2 SECV1113 SEM 2 2000/2001

QUESTION 1

Develop a program to calculate differentiation of the non-linear equations

You need to consider the following requirements:

a. Lets **f(x) = *ax^3 +bx^2 + cx + d*** is a non-linear equation. Your program should be able to get input from user (any value of a, b, c and d)
b. Ask the user to enter point P. If point P is on the curve, do question c, d, e and f. Otherwise, give error message.
c. Calculate the gradient of the curve in question a) at point P
d. Find the equation of the tangent to the function at point P.
e. Find the stationary points and the nature of the stationary points (max/min turning point, inflection point)
f. Display the output in question b, c, d, e

QUESTION 2

Develop a program to calculate integration of the non-linear equations

You need to consider the following requirements:

a. Lets **f(x) = *ax^2 +bx + c*** is a non-linear equation. Your program should be able to get input from user (any value of a, b and c)
b. Find the integration of the equation.
c. Ask the user to enter upper limit and lower limits.
d. Calculate the area between the curve in question a) and the x-axis within the upper and lower limit. Find the x-intercept. If the x-intercept is in between the upper and lower limits, you have to consider positive and negative area as what you have learnt in the class.
e. Display the output in question b, c, d.

QUESTION 3

You are required to develop a program to apply numerical differentiation.

You need to consider the following requirement

1. Use an equation $f(x)$ as listed below (refer to the group)
2. Get inputs from user for the values of a, b, c, d, no of points to be generated, h and x_0.
3. Generate and display the value of x_i and $f(x_i)$
4. Use three-points data central difference formula that you have learnt in the class to find the first derivative of the equation at point x = b (ask the user to enter value of b)
5. Display an error message if the user makes a mistake during input the data.

List of equation

a. $(x) = \frac{ax^5\sqrt{bx^3+1}}{cx+d}$

b. $(x) = \frac{ax^2+bx+d}{\sqrt{cx+1}}$

QUESTION 4

You are required to develop a program to apply numerical Integration.

You need to consider the following requirement

1. Use an equation $f(x)$ as listed below (refer to the group)
2. Get inputs from user for the values of a, b, c, d, lower limit (l), upper limit (u) and h.
3. Generate and display the value of x_i and $f(x_i)$
4. Use Trapezoidal Rule that you have learnt in the class to find the integration of the equation for that limit.
5. Display an error message if the user makes a mistake during input the data.

List of equation

a. $f(x) = \sqrt{x} + a\sqrt{x^b} - \frac{c}{\sqrt{x^d}}$

b. $f(x) = \sqrt[3]{x^a}(bx - cx^d)$

QUESTION 5

Develop a program to calculate Vector

You need to consider the following requirements:

1. Ask the user to input two points: A(x1, y1, z1) and B(x2, y2, z2). Then calculate vector AB. Display the vector in equation form. Calculate magnitude and vector unit.
   - Ask the user to input two vectors- vector a (pi+qj+rk) and vector b (mi+nj+ok). Calculate a + 2b
   - Calculate a.b (scalar product)
   - Calculate a x b (vector product)
   - Calculate the angle between vector a and vector b. Use the formula that you have learnt in the class
2. Provide the user with a menu.