21BDS0340

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# Digital Lab Assignment 1

## Problem 1

Write the MATLAB code for derivative of different order for y= x­4 - 3x3 + 2 and plot in one window and use it to plot in different sub windows. Use colour, marker, labelling, legend syntaxes.

### Code:

syms x

f = x^4 - 3\*x^3 + 2

df = diff(f) % first derivative

ddf = diff(df) % second derivative

subplot(2,2,1)

fplot(f, "r", "LineWidth", 1.5)

hold on

fplot(df, "b", "LineWidth", 1.5)

fplot(ddf, "g", "LineWidth", 1.5)

xlabel("x")

ylabel("y")

legend(string(f), string(df), string(ddf))

subplot(2,2,2)

fplot(f, "r", "LineWidth", 1.5)

xlabel("x")

ylabel("y")

legend(string(f))

subplot(2,2,3)

fplot(df, "b", "LineWidth", 1.5)

xlabel("x")

ylabel("y")

legend(string(df))

subplot(2,2,4)

fplot(ddf, "g", "LineWidth", 1.5)

xlabel("x")

ylabel("y")

legend(string(ddf))

hold off

### Text, letter Description automatically generatedOutput:

Graphical user interface, diagram

Description automatically generated

## Problem 2

Use the limit syntax and write the code for checking differentiability of any arbitrary function at any point. Plot the function and tangent line at the differentiable point. Choose function and points yourself.

### Code:

syms x h

f = input("Enter function: ");

x\_value = input("Enter place to check differentiability, x = ");

lim\_eq = (subs(f, x + h) - subs(f, x))/h;

limit\_f = limit(lim\_eq, h, 0);

fplot(f, "LineWidth", 1.5)

hold on

legend(string(f))

try

lim\_value = subs(limit\_f, x\_value)

% building tangent line

y\_value = subs(f, x\_value);

g = lim\_value \* (x - x\_value) + y\_value;

fplot(g, "LineWidth", 1.5)

legend(string(f), string(g))

catch

disp(['The function is not differentiable at x = ', num2str(lim)])

end

hold off

### Chart, line chart Description automatically generatedGraphical user interface, text, application, email Description automatically generatedOutput: