Complex Systems Boot Camp

ISC6930 | SECTION#2 | DATE: .....

NAME: ..... | SS#: ..... | POINTS: .....

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1) Find the derivative of the function $f(x) = x^2 - x$ using the difference quotient.

2) Find the derivative of the following functions with respect to x:

a) $f(x) = x^2 - x^{-\frac{1}{2}}$

b) $f(x) = 3\sin x + \cos x$

c) $f(x) = e^x + 2\,\ln x$

d) $f(x) = x\,e^x$

e) $f(x) = \frac{x^2+3}{x+2}$

f) $f(x) = \sin(x^2 - x)$

Now don't panic!

g) $f(x) = e^{3x\,\cos 2x}$

h) $f(x) = \ln\{\sin(3x^4 - 3)\sin x\}$

i) $f(x) = \frac{\sqrt{\sin^2 x - x^3}}{x^2+3}$

j) $f(x) = \frac{2\,\cos^2 x - 2 + 2\,\sin^2 x + x^2\,\sin 3x}{\sqrt{4 - 4\,\cos^2 3x}}$

3) Plot the function $f(x) = x - x^2$.

Calculate the derivatives at the following points: $x = 0.2,\ 0.5,\ 0.7$.

What does the sign of the derivative at these points tell you about the nature of the function?

4) Plot $f(x) = \sin x$. Calculate $\int_0^{2\pi} \sin x\,dx$ from the graph you have drawn.

5) Evaluate the following indefinite integrals:

a) $\int (2\,x + \frac{1}{2})x^{-\frac{2}{3}}$

b) $\int (3\,\sin x + \cos x)\,dx$

Compare these results with the solutions of 2 a) and 2 b).

6) Evaluate $\int_0^{2\pi} \sin^3 x\,dx$ (Hint: Use the method of substitution.)

7) Evaluate a) $\int_1^2 x^2\,\ln x\,dx$ b) $\int_0^{\pi} x\,\sin x\,dx$ (Hint: Integrate by parts.)