Math Camp

Day 1 Exercises

Exercise 1

Differentiate the following functions:

a) $f(x) = 18x^{1/2}$ b) $f(t) = (2t^4 + 5)(3t^5 - 8)$ c) $f(x) = \frac{10x^8 - 6x^7}{2x}$

d) $f(y) = (6y^3 + 9)^4$ e) $f(x) = \frac{1}{7x^3 + 13x + 3}$ f) $f(u) = \left(\frac{3u+4}{2u+5}\right)^2$

Exercise 2

For each of the following functions, find the first- and second-order derivatives. Tell if the functions are:

1) increasing, decreasing or stationary at $x = 2$
2) concave or convex at $x = 2$

a) $f(x) = 7x^3 + 5x^2 + 12$ b) $f(x) = (x^4 - 3)(x^3 - 2)$ c) $f(x) = \frac{7x^2}{x-1}$

Exercise 3

Find the second-order direct partial derivatives and the cross partial derivatives for each of the following functions.

a) $f(x_1, x_2) = x_1^3 - 9x_1 x_2 - 3x_2^2$ b) $f(x_1, x_2) = (7x_1 + 3x_2)^3$

Exercise 4

Differentiate each of the following logarithmic functions.

a) $f(x) = ln2x^3$ b) $f(x) = (ln8x)^2$ c) $f(x) = ln\frac{x^3}{(2x+5)^2}$

Exercise 5

Differentiate each of the following exponential function.

a) $f(x) = e^{2x}$ b) $f(x) = x^2 e^{5x}$ c) $f(x) = \frac{e^{5x}-1}{e^{5x}+1}$

Exercise 6

Evaluate the following definite integrals.

a) $\int_0^6 5x dx$ b) $\int_0^{10} 2e^{-2x} dx$ c) $\int_0^3 8x(2x^2+3) dx$