



UNIVERSITY OF RUHUNA
DEPARTMENT OF MATHEMATICS

BACHELOR OF SCIENCE (GENERAL) DEGREE (LEVEL II)
INDUSTRIAL MATHEMATICS
IMT 2b2β: Mathematical Computing

Assignment No: 07

Semester I, 2012

1. Find first derivative of the following functions.

(i) $y = \frac{5x^3}{x^{-12}} + x^{1/3}.$

(iv) $y = \frac{e^x}{6} + \frac{1}{x^4}.$

(ii) $y = \sin x \cos x.$

(v) $v = \frac{(x^4 + 2x)}{(x^5 - 8x)}.$

(iii) $y = \cos t + t^4 + 7t + \frac{1}{t^5}.$

(vi) $y = \ln(4x^3 + 5x + 2).$

2. Find second and third derivatives of the following functions.

(i) $h = \frac{(x^2 + 1)}{e^x - \tan x}.$

(iv) $y = 5e^t + t^6 + 7(t + e^t).$

(ii) $y = e^x(3x^5 - 1).$

(v) $y = 2e^x + 5x.$

(iii) $v = (x^4 + 2x)(x^5 - 8x).$

(vi) $y = \ln(2x^3 + 1).$

3. Find the first order partial derivatives with respect to x and y of the following functions.

(i) $f(x, y) = 4x^3y^3 + y^3x^4.$

(iii) $h(x, y) = \ln(4x^3 + 5y^4 + 9).$

(ii) $g(x, y) = \cos(x^2 + y^2).$

(iv) $f(x, y) = xye^{x^2y^3}.$

4. Evaluate the following partial differentials.

(i) $\frac{\partial}{\partial x}(x^3y^2 + x \sin y).$

(iii) $\frac{\partial^4}{\partial x^4}(x^8y^2 + x^7y^3 - x^4y^9).$

(ii) $\frac{\partial^2}{\partial x \partial y}(x^3y^2 + x^5y^4 - 5xy).$

(iv) $\frac{\partial^3}{\partial y^3} \frac{\partial^4}{\partial x^4}(x^8y^2 + x^7y^3 - x^4y^9).$

5. (i) Suppose you have a generic production function $Y = F(A, K, L)$ where K is capital, L is labor and A is technology. Obtain an expression for total differential of Y .
- (ii) Suppose that $f(x, y) = x \cos(\pi y) + y^2 e^x$. Find total derivative of $f(x, y)$.
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6. (i) Find the gradient of $f(x, y) = \sin x + e^{xy}$.
- (ii) Find the gradient of $f(x, y, z) = xy^2 + yz^3 + xy^2$.
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7. Find the Jacobian matrix of following functions.
- (i) $g(x, y) = (4x^5 - 2x^2y^5 + 8x - y + 10, x^5y^2 + y^2x^3)$.
- (ii) $h(x, y) = (e^{x^2y^2}, \cos(x^3y^4))$.
- (iii) $f(x, y, z) = (r \sin \theta \cos \delta, r \sin \theta \sin \delta, r \cos \theta)$
