

# ENGINEERING ANALYSIS

## TUTORIAL 5          PARTIAL DIFFERENTIATION - REVISION

In questions 1 - 10 find the first partial derivatives of  $f$ , i.e.  $\frac{\partial f}{\partial x}$  and  $\frac{\partial f}{\partial y}$ .

1.  $f(x,y) = 2x^4y^3 - xy^2 + 3y + 1$

2.  $f(x,y) = (x^3 - y^2)^2$

3.  $f(x,y) = \sin(xy)$

4.  $f(x,y) = (\sin x)(\sin y)$

5.  $f(x,y) = \sqrt{x^2 + y^2}$

6.  $f(x,y) = \frac{x}{y} - \frac{y}{x}$

7.  $f(x,y) = x e^y + y \sin x$

8.  $f(x,y) = e^x \ln xy$

9.  $f(x,y) = \tan^{-1}(x/y)$

10.  $f(x,y) = e^{xy}$

In questions 11 - 15 verify that  $f_{xy} = f_{yx}$ , i.e.  $\frac{\partial^2 f}{\partial x \partial y} = \frac{\partial^2 f}{\partial y \partial x}$ .

11.  $f(x,y) = xy^4 - 2x^2y^3 - 4x^2 - 3y$

12.  $f(x,y) = \frac{x^2}{x+y}$

13.  $f(x,y) = \cos(xy)$

14.  $f(x,y) = e^{xy}$

15.  $f(x,y) = y^2e^x + x^2e^y$

In questions 16 - 20 find  $f_{xyz}$  i.e. find  $\frac{\partial^3 f}{\partial x \partial y \partial z}$

16.  $f(x,y,z) = xyz$

17.  $f(x,y,z) = 3x^2y^2 + 4y^2z^2 + 5x^2z^2$

18.  $f(x,y,z) = \cos(xyz)$

19.  $f(x,y,z) = (\sin x)(\sin y)(\sin z)$

20.  $f(x,y,z) = e^{xyz}$