**MATHEMATICS FOR AERO/MECHANICAL ENGINEERS**

**TUTORIAL SHEET 8**

**PARTIAL DIFFERENTIATION - REVISION**

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

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. $f(x,y) = (sinx)(siny)$
5. $f(x,y) = \sqrt{(x^2 + y^2)}$              6. $f(x,y) = \dfrac{x}{y} - \dfrac{y}{x}$

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. $\dfrac{\partial^2 f}{\partial x \partial y} = \dfrac{\partial^2 f}{\partial y \partial x}$.

11. $f(x,y) = xy^4 - 2x^2y^3 - 4x^2 - 3y$       12. $f(x,y) = \dfrac{x^2}{x + y}$

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* $\dfrac{\partial^3 f}{\partial x \partial y \partial z}$

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

MathScope