November 9, 2004 Lecturer Dmitri Zaitsev Michaelmas Term 2004

Course 2E1 2004-05 (SF Engineers & MSISS & MEMS)

S h e e t 4

Due: in the tutorial sessions next Wednesday/Thursday

Exercise 1

Use Chain Rule to express $\frac{dw}{dt}$ as a function of t in the following cases:

(i) $w = x + y^2$, $x = \cos t$, $y = \sin t$;

(ii) $w = \frac{x}{y}$, $x = e^t$, $y = \sin t$;

(iii) $w = \ln(x - y + z)$, $x = \cos t$, $y = \sin t$, $z = \sqrt{t}$;

(iv) $w = z + \sin(xy)$, $x = t$, $y = \ln t$, $z = t^2$.

Exercise 2

Use Chain Rule to express $\frac{\partial z}{\partial r}$ and $\frac{\partial z}{\partial \theta}$ as functions of r and θ in the following cases:

(i) $z = xe^y$, $x = r\cos\theta$, $y = r\sin\theta$;

(ii) $z = \frac{x}{y}$, $x = r\cos\theta$, $y = r\sin\theta$;

(iii) $z = x^2 + y^2 + u^2$, $x = r\cos\theta$, $y = r\sin\theta$, $u = r$.