241 Homework 3 - Due Friday June 16 (slide it under my door at DRL 4N17)

The Cauchy-Riemann Equations

a) 17.6.15

b) Show that in polar coordinates the Cauchy-Riemann equations become $\frac{\partial u}{\partial r} = \frac{1}{r}\frac{\partial v}{\partial \theta}$ and $\frac{\partial v}{\partial r} = -\frac{1}{r}\frac{\partial u}{\partial \theta}$.

Some Integrals Note that some of these will become trivial using methods from later sections. Please do each problem according to the methods of its respective section in the book.

a) 18.1.3

b) 18.2.19 (*Hint: partial fractions.*)

c) 18.3.17 Why can we use anti-derivatives in this problem but not, for example, when integrating $\frac{1}{z}$ around the unit circle?

d) 18.4.13

e) 18.4.23

Series

a) 19.2.15

b) 19.2.20

c) 19.3.3 Conclude that $f(z)$ is not analytic at $z = 0$ (unlike the real function $f(x) = e^{-\frac{1}{x^2}}$, which is differentiable at $x = 0$).