ECE 6382

Fall 2023

Homework Set #1

Homework problems are from *Mathematical Methods for Physicists*, 7th Ed., by Arfken, Weber, and Harris.

Chapter 1, Section 8, Complex Numbers and Functions

Prob. 1.8.1
Prob. 1.8.3(a)
Prob. 1.8.6(b) (first part only, for $|\sin z|$)
Prob. 1.8.7(b) (first part only, for $|\sinh z|$) (Please see note 1.)
Prob. 1.8.10
Prob. 1.8.11

Chapter 11, Section 2, Cauchy-Riemann Equations

Prob. 11.2.1
Prob. 11.2.3 (Please see note 2.)
Prob. 11.2.7 (Please see note 3.)
Prob. 11.2.11 (Please see note 4.)

NOTES

Note 1: Please note the misprint in part (b): $\left|\cosh z\right|^2 = \cosh^2 x - \sin^2 y$.

Note 2: As a hint, note that if we know df / dx, we can write $f(x) = \int\left(\dfrac{df}{dx}\right)dx + C$,

where C is a constant. Generalizing this to a function of two variables, if we know

$\partial u(x,y)/\partial x$ we can write $u(x,y) = \int\left(\dfrac{\partial u(x,y)}{\partial x}\right)dx + g(y)$, where $g(y)$ is an arbitrary

function of y. In your answers, remember to include any constants that are allowed to be

there!

Note 3: Note that $dz = dr\,e^{i\theta}$ if r changes with θ fixed, and $dz = d\theta\left(ire^{i\theta}\right)$ if θ changes with r fixed. You will also need to use the product rule for derivatives to see how $R(r,\theta)e^{\Theta(r,\theta)}$ varies when both r and θ change independently.

Note 4: Please note the misprint: $u(x,v)$ should be $u(x,y)$.