Physics 604 Homework #1 Fall '20
Dr. Drake

Note that the Arfken problems correspond to the 7th Edition with the corresponding 6th Edition problems in the parentheses.

1. Arfken
   1.8.6(a) (6.1.10(a)) Show that $\sin(x+iy) = \sin(x)\cosh(y) + i\cos(x)\sinh(y)$,
   11.2.1 (6.2.2) Is $f(z) = Re(z) = x$ analytic?,
   11.2.2 (6.2.3) Show that u and v can not have a maximum or minimum where $w = u + iv$ is analytic,
   11.2.7 (6.2.8) Find the Cauchy-Riemann Conditions in polar coordinates,
   11.10.4(a) (6.7.1(a)) Find how circles in the z plane transform for $w = z + \frac{1}{z}$

2. Show how the lines $x = c_1$ and $y = c_2$ transform for $w = \sin(z)$.

3. Find the zeros of $\sin(z)$ and $\cosh(z)$

4. Define a cut in the complex z plane to make $z^{1/3}$ single valued. Evaluate $Arg[(-i)^{1/3}]$.

5. Define cuts in the complex z plane to make the function

$$f(z) = \ln(z^2 - 1)$$

   single valued. Find $Im(f)$ above and below your cut. Is your answer unique?