

## Math 417 Homework 5

Due October 6

**Important Note:** Be sure to prove your answer is correct in all problems.

1. Suppose  $x$  is fixed. Determine  $\lim_{y \rightarrow \infty} \frac{\sin(x+iy)}{e^y}$  and  $\lim_{y \rightarrow \infty} \frac{\cos(x+iy)}{e^y}$ .
2. Determine the value of  $\cos(1 + 2i)$  and all values of  $\sin^{-1}(3)$ .
3. Evaluate  $\int_0^1 (2 + it)^2 dt$  and  $\int_0^\pi \sin(2it) dt$ .
4. Let  $C$  be circle of radius 1 centered at the origin, oriented counterclockwise. Determine  $\int_C (\bar{z})^2 dz$ .
5. Let the contour  $C$  be the triangle with vertices  $(0, 0)$ ,  $(2, 0)$ , and  $(0, 2)$ , oriented counterclockwise. Let  $f(x + iy) = xy + i(x^2 - 2y)$ . Determine  $\int_C f(z) dz$ .
6. Let  $C$  be the contour starting at  $z = -1$ , going around the circle  $|z| = 1$  counterclockwise, and ending out at  $z = -1$  again. Find  $\int_C \frac{\text{Log}(z)}{z} dz$ .