

Homework #4 (Math 300):

- (1) For what values of z are the functions below differentiable? analytic?
Justify your answers.
 - (a) $f(z) = z(\operatorname{Im}(z))$
 - (b) $f(z) = (\operatorname{Re}(z))^2 + (\operatorname{Im}(z))^2$
- (2) §2.4 :
 - (a) #8
 - (b) #14
- (3) §2.5 :
 - (a) #2
 - (b) #6
- (4) For each of the following functions, decide whether or not $u(x, y)$ is harmonic in the entire plane and if so find a harmonic conjugate.
 - (a) $u(x, y) = 2x - x^3 + 3xy^2$
 - (b) $u(x, y) = 3x - x^3 + 3xy^2$
 - (c) $u(x, y) = 3x - 2x^3 + 3xy^2$
- (5) Which of the following polynomials can be factored into linear and quadratic factors, each with real coefficients? For each that can be so factored, find the factors.
 - (a) $p(z) = z^3 + z - 2$
 - (b) $p(z) = (z - i)^2 + 2iz$
- (6) Find the Taylor form of the following polynomials centered at z_0 :
 - (a) $p(z) = iz^3 - 5z + 2, z_0 = i.$
 - (b) $p(z) = 3i, z_0 = 7 + 5i.$