# MATH 132 HOMEWORK 2

- (2.1) 3

- (2.2) 11, 25
  $*$ For # 11 you may use that polynomials are continuous on $\mathbb{C}$ and that rational functions are continuous at each point where the denominator does not vanish.

- (2.3) 2, 3, 10

- (2.4) 5, 8, 10

- (2.5) 5, 6

- (3.1) 4, 11, 13, 14, 15

- (3.2) 13

- Suppose that $f = u + iv : \mathbb{C} \to \mathbb{C}$ is entire and that the first partial derivatives of $u$ and $v$ are continuous on $\mathbb{C}$. Show that $g(z) := \overline{f(\bar{z})}$ is entire.

- Show that all of the roots of the polynomial $P(z) = z^n + 2z^{n-1} + 3z^{n-2} + \ldots + nz + (n+1)$ lie *outside* the open unit disk (i.e., every root has absolute value $\geq 1$).
  *Hint:* Let $f(z) = (1-z)P(z)$ and suppose, by way of contradiction, that $\rho$ is a root of $f$ which satisfies $|\rho| < 1$. Show that $n + 1 = \rho + \rho^2 + \rho^3 \ldots + \rho^{n+1}$ and argue that this is impossible.

Extra Practice (do not turn in):
(2.1) 5; (2.2) 12; (2.3) 13; (2.4) 11, 16; (2.5) 3, 14; (3.2) 5, 25