

# Math 131B-1: Analysis – Homework 9

Due: June 7, 2017

## Exercise 1.

- (1) Prove the following properties of  $\ln$ , using the exponential function:
  - a)  $\ln(xy) = \ln(x) + \ln(y), \forall x, y \in (0 + \infty)$ ;   b)  $\ln(1) = 0, \ln(1/x) = -\ln(x), \forall x \in (0, +\infty)$ ;
  - c)  $\ln(x^y) = y \ln(x), \forall x \in (0, +\infty), y \in \mathbb{R}$ .
- (2) Prove that  $\cos(x) = 0$  iff  $x/\pi = k + 1/2$ , for some  $k \in \mathbb{Z}$ .
- (3) Exercise 4.7.2, 4.7.4, 4.7.5 and 4.7.6 from Tao (page 104 in my version).

## Exercise 2.

- (1) Exercise 4.5.2 from Tao, which is an elegant way to show that  $e$  is irrational.
- (2) Exercise 4.5.6 from Tao (page 93 in my version).
- (3) Exercise 4.5.7 from Tao (page 93 in my version).

## Exercise 3.

- (1) Exercise 4.5.8 from Tao (page 93 in my version).
- (2) Exercise 4.5.9 from Tao (page 93 in my version).

## Exercise 4.

Exercises 4.7.7, 4.7.9 and 5.1.1 from Tao.