**Homework 11**
MATH 166 - Spring 2023
Tufts University, Department of Mathematics
Instructor: James M. Murphy
Due: April 27, 2023

BOOK QUESTIONS

Wasserman: Chapter 11: #2 (a)-(c), #3; Chapter 20: #4

SUPPLEMENTAL QUESTION 1 (HISTOGRAM AND KDE BANDWIDTH)

For each of the following random variables and sample sizes $n$, construct (i) a histogram estimator for the density at a range of bin sizes and (ii) a kernel density estimator using the Gaussian kernel at a range of bandwidths. Describe the behavior qualitatively, and connect back to our theoretical discussions of the bias-variance trade-off and optimal bin/bandwidths.

(a) $X \sim \text{Unif}([0, 1])$, $n = 100$.

(b) $X \sim \text{Unif}([0, 1])$, $n = 10000$.

(c) $X \sim \mathcal{N}(0, 1)$, $n = 100$.

(d) $X \sim \mathcal{N}(0, 1)$, $n = 10000$.