

**Mathematics 1550H – Introduction to probability**

TRENT UNIVERSITY, Winter 2017

**Assignment #4**

**Sums and Convolutions**

*Due on Thursday, 6 April, 2017.*

Please read through Chapter 7 of the textbook, the bulk of which is concerned with the problem of determining the distribution or density function of the sum of two independent random variables, before tackling the problems below.

1. Suppose a fair standard die is rolled twice, and the random variables  $X_1$  and  $X_2$  return the numbers on the faces that come up on the first and second rolls, respectively. Compare and contrast the possible values, probability distribution functions, expected values, and variances of the random variables  $Y = 2X_1$  and  $Z = X_1 + X_2$ . [5]
2. Suppose that the continuous random variables  $X$  and  $Y$  have the probability density functions  $f(x) = \begin{cases} 1+x & -1 \leq x \leq 0 \\ 1-x & 0 \leq x \leq 1 \\ 0 & \text{otherwise} \end{cases}$  and  $g(y) = \begin{cases} y & 0 \leq y \leq 1 \\ 2-y & 1 \leq y \leq 2 \\ 0 & \text{otherwise} \end{cases}$ , respectively. Determine the probability density function  $h(z)$  of the random variable  $Z = X + Y$ . [5]