Mathematics 1550H – Introduction to probability
Trent University, Summer 2017
Assignment #6
Sums and Convolutions
Due by Saturday, 29 July, 2017, at the exam.

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 od 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 $f(x) = \begin{cases} \frac{1}{2}x & 0 \le x \le 2 \\ 0 & \text{otherwise} \end{cases}$ and $g(y) = \begin{cases} 1 - \frac{1}{2}y & 0 \le y \le 2 \\ 0 & \text{otherwise} \end{cases}$, respectively. Determine the probability density function $h(z)$ of the sum of these random variables, $Z = X + Y$. *[5]*