1. (3 points) **Blades of grass**

   Suppose that the heights of blades of grass are Normally distributed and independent, with each height having expected value 4 inches and standard deviation 0.75 inches. A child picks the blades of grass.

   (a) (1 point) What is the probability that the height of 1 blade of grass is 5 inches or taller?

   (b) (1 point) How many blades of grass does the child expect to pick until the first blade of grass appears with height 5 inches or taller?

   (c) (1 point) Now, instead of the setup in 1b, suppose that the child picks exactly 10 blades of grass. What is the expected number of blades of grass that have height 5 inches or taller, within this collection of 10 blades of grass?

2. (4 points) **Event planner**

   In planning for an event, the planner estimates that nobody will be on time, but nobody will be more than 10 minutes late. So he estimates that the time (in minutes) a given person will be late has the following probability density function (pdf):

   $$f_X(x) = \frac{(10 - x)^3}{2500}, \quad 0 \leq x \leq 10$$

   and $f_X(x) = 0$ otherwise.

   (a) (2 points) Find the expected value and variance of X

   (b) (2 point) Estimate the probability that, among a group of 200 attendees who behave independently and follow the behavior described above, the total sum of their delay in arriving is more than 420 minutes.

3. (3 points) **Continuous joint distributions**

   Suppose X and Y are continuous random variables with joint probability distribution function $f(x, y) = x + y$ on the unit square $[0, 1] \times [0, 1]$.

   (a) (1 point) Let $F(x, y)$ be the joint cumulative density function (cdf). Compute $F(1, 1)$. Compute $F(x, y)$.

   (b) (1 point) Compute the marginal probability distribution functions for X and Y.

   (c) (1 point) Are X and Y independent random variables?