Mathematical Probability, Math 411 - Homework 11

From the textbook solve the problems 29,31,32,33,34,35,36 and 37 from the Chapter 4.
And also the problems below:

Problem 1. Break a stick of length 1 at a uniform location and then choose either of the two parts with equal probabilities. If X denotes the length of the part you choose, compute $\mathbf{E}[X]$ and $\text{var}(X)$.

Problem 2. Consider the triangle with vertices $(0,0)$, $(1,0)$ and $(0,1)$. Let Z be a uniform random variable in the interval $[0,1]$. Draw a vertical line that intersects the x axis at Z. This line divides the triangle in two pieces. Select a point (X,Y) uniformly at random from the right piece. Find the expectation $\mathbf{E}[X]$ of the x coordinate of the selected point.

Hint: You might have to integrate an ugly looking function. Factor the numerator, cancel stuff and simplify the function.