Math 461
HW 3
Recap

1. There were several consistent errors on many peoples papers, and I went over them in class on Monday

(a) When a number is chosen at random in an interval, it is always assumed to be a real number, not an integer. If it's meant to be an integer, the set will be enumerated, so #1 is not $\Omega = \{4,5,6,\dots,16\}$!

(b) Setting up two independent events is almost always done as an array, with one event listed vertically and the other horizontally. If you try to do it less systematically you'll probably forget some possible outcomes

(c) It is true that if A and B are independent, and $P(A), P(B) \neq 0$ then $P(A|B) = P(A)$ and $P(B|A) = P(B)$. But the main point is that $P(A \cap B) = P(A)P(B)$

2. It turns out that I should have given the definition in my notes: X and Y are <u>independent random variables</u> if for any two sets $I, J \subseteq \mathbb{R}$, the events $X \in I$ and $Y \in J$ are independent events, i.e. $P(X \in I \text{ & } Y \in J) = P(X \in I)P(Y \in J)$

3. Another example X chosen randomly in $[4, 16]$, $Z = \frac{1}{X}$. Then $\frac{1}{16} \leq Z \leq \frac{1}{4}$ and if $\frac{1}{16} \leq t \leq \frac{1}{4}$, then $P(Z \leq t) = P(X \geq \frac{1}{t}) = P(X \in [\frac{1}{t}, 16]) = \frac{16 - \frac{1}{t}}{16 - 1} = \frac{16}{15} - \frac{1}{15t}$. The graph of the cdf $F_Z(t) = P(Z \leq t)$ is shown below