HW 6 Math/Stat 563 Due Friday Oct. 31, 2019

1. (Durrett 3.3.12 modified) Let $c$ be a constant. Show that $X_{n} \rightarrow c$ in probability if and only if $X_{n} \Rightarrow c$.
2. Let $\left\{X_{n}\right\}$ be iid and uniformly distributed on the finite set $\{1,2, \ldots, m\}$. In repeated sampling, let $\nu_{m}$ be the time of the first coincidence, that is the time when an outcome is first repeated:

$$
\nu_{m}=\inf \left\{n \geq 2: X_{n} \in\left\{X_{1}, \ldots, X_{n-1}\right\}\right\}
$$

Show the weak convergence

$$
\frac{\nu_{m}}{\sqrt{m}} \Rightarrow \nu
$$

and compute $P(\nu>x)$ for $x>0$.
3. (Durrett 3.3.1) Show that if $\varphi$ is a ch. f., then $\operatorname{Re}(\varphi)$ and $|\varphi|^{2}$ are also ch. f.'s.

