Implement the Guerre, Perrigne, and Vuong procedure for an IPV auction model:

1. Generate 1000 valuations $x \sim U[0,1]$. Recall (as derived in lecture notes) the equilibrium bid function in this case is
$$b(x) = \frac{N-1}{N} \cdot x.$$
2. For 500 of the valuations, split them into 125 4-bidder auctions. For each of these valuations, calculate the corresponding equilibrium bid.
3. For the other 500 valuations, split them into 100 5-bidder auctions. For each of these valuations, calculate the corresponding equilibrium bid.
4. For each b_i, compute the estimated valuation $\tilde{x}_i$ using the GPV equation:
$$\frac{1}{g(b_i)} = (N_i - 1)\frac{x_i - b_i}{G(b_i)}$$
$$\Leftrightarrow x_i = b_i + \frac{G(b_i)}{(N_i - 1)g(b_i)}$$
(where N_i denotes the number of bidders in the auction that the bid b_i is from).

   In computing the G and g functions, use the *Epanechnikov kernel*:
$$\mathcal{K}(u) = \frac{3}{4}(1 - u^2)\mathbf{1}(|u| \leq 1)$$
   Try four different bandwidths $h \in \{0.5, 0.1, 0.05, 0.01\}$.

   For each case, plot x vs. $\tilde{x}$. Can you comment on performance of the procedure for different bandwidth values?
5. Compute and plot the empirical CDF's for the estimated valuations $\tilde{x}_i$, separately for $N = 4$ and $N = 5$.