Name: _____

Directions: Show all work. No credit for answers without work.

1. **[2 points]** Give the definition of the order of an element a in $\mathbb{F}_p$.

2. **[2 points]** Find the order of 5 in $\mathbb{F}_{11}$.

3. **[2 points]** List out all the possibilities for the order of an element in $\mathbb{F}_{13}$.

4. **[2 parts, 1 point each]** Suppose you wish to check whether 2 is a primitive root in $\mathbb{F}_{151}$.

   (a) Which modular exponentiation computations would you need to perform? Use as few computations as possible. (Do not actually perform the computations.)

   (b) Describe how you would interpret the results of your computations in part (a) to determine whether 2 is a primitive root in $\mathbb{F}_{151}$.

5. **[2 points]** Given that 7 is a primitive root of $\mathbb{F}_{71}$, find three more primitive roots of $\mathbb{F}_{71}$.