1. Which of the following are perfect numbers? Explain!
   a. 496; b. 100; c. 1000; d. 8128.

2. Using the Lucas-Lehmer test (no credit for other methods), show that $M_{11} = 2^{11} - 1 = 31$ is not a Mersenne prime. **Note:** You may use a calculator (or computer) to compute $S_9$.

3. (Without peeking at your notes), prove that if $p$ is a prime, and $2^p - 1$ is also a prime, then 
   $$2^{p-1} \cdot (2^p - 1)$$
   is a perfect number.

4. (Without peeking at your notes), prove that if $p$ and $q$ are distinct odd primes, then $pq$ can **not** be a perfect number.

5. (Without peeking at your notes), state precisely the Lucas-Lehmer test for testing whether $M_p$ is a Mersenne prime.

6. (Without peeking at your notes), prove that if $n$ is an integer that is not a prime, then $2^n - 1$ is not a prime either.