Math 255 (Reading) Quiz 19 April 5 2017

Name:

Problem 1: *It is a fact that*

$$2^1 \equiv 2 \pmod 4, \quad 2^2 \equiv 4 \pmod 5, \quad 2^3 \equiv 3 \pmod 5, \quad 2^4 \equiv 1 \pmod 5.$$

What is the index of 4 *relative to* 2*?*
For a maximum of two points you may give the definition of the index of a relative to r.

Solution:
If r is a primitive root of n, then the index of a relative to r is the class $\operatorname{ind}_r a$ modulo $\phi(n)$ such that

$$r^{\operatorname{ind}_r a} \equiv a \pmod n.$$

Since $4 \equiv 2^2 \pmod 5$, the index of 4 relative to 2 is 2, the exponent to which 2 must be raised to give 4.