The geometric series tells us that for every number $r$ with $|r| < 1$,

$$\frac{1}{1-r} = 1 + r + r^2 + r^3 + \ldots = \sum_{n=0}^{\infty} r^n \quad \text{(diverges for } |r| \geq 1\text{)}.$$

or (equivalently), by replacing $r$ by $-r$,

$$\frac{1}{1+r} = 1 - r + r^2 - r^3 + \ldots = \sum_{n=0}^{\infty} (-1)^n r^n \quad \text{for } |r| < 1.$$

It is very important, especially while you’re in Math 129, that you know at least the first formula (the second is easily obtained from the first). And note that when speaking of “the geometric series”, we are almost always speaking of the INFINITE series, as indicated above, not the finite series. This is especially true, probably most certainly true, in the context of Taylor series.

**HERE IS THE IMPORTANT POINT.**

You should be able to take either one of the series above, replace $r$ by any real number with absolute value less than 1, and obtain a new series. For example, if $blob$ is a number with $|blob| < 1$, then

$$\frac{1}{1-blob} = 1 + blob + blob^2 + blob^3 + \ldots = \sum_{n=0}^{\infty} blob^n \ldots$$

AND, you should be able to take other algebraic rational functions with a linear expression in the denominator, convert them so that they look like $1/(1-r)$, and then use the series above.

Several examples of this were done in class on the Monday and/or Wednesday of the week of the exam. Several examples of this were on the written homework. Several examples of this were in WebAssign. (The problem given on the exam was done in class the week of the exam.)

As mentioned in class, the geometric series and the exponential series are the most important series. You should know them, and you should be able to manipulate them as discussed in the textbook, in class, and above, to obtain other series. Here, as a reminder, is the exponential series (about $x = 0$).

$$e^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$$