Exponential Theorem.

1. Find two expressions each for the coefficients of x^2, x^3, and x^n in the development of $e^a e^x$, and show their identity.

2. Develop e^{mx} in powers of x to six terms.

3. What is the coefficient of $x^m y^n$ in the development of e^{x+y}? In that of e^{x-y}?

4. Multiply the two developments:

$$e^x = 1 + x + \frac{x^2}{1.2} + \frac{x^3}{3!} + \ldots.$$

$$e^{-x} = 1 - x + \frac{x^2}{1.2} - \frac{x^3}{3!} + \ldots.$$

and show by what relations among the coefficients the product reduces identically to unity.

5. Show by what relations the development of e^{2x} becomes identical with the square of that of e^x.

Logarithms and Logarithmic Series.

1. Express the logarithm of the continued product of all the terms of a geometrical progression.

Calling b the arbitrary base of the system of logarithms, solve the following equations so as to express x in terms of y:

2. $\log x = y$.
3. $\log x = ay$.
4. $\log 2x = y$.
5. $\log mx = a + y$.
6. $\log ax = my$.
7. $\log x^2 = y$.
8. $\log x^n = my$.
9. $y = b^{\log x}$.
10. $y = a^{\log x}$.
11. $ma^{\log x} = y^2$.

Reduce to their simplest form the expressions:

12. $\frac{a^{\log c}}{c^{\log a}}$.
13. $2a^{\log c} - c^{\log a}$.

Prove the identities:

14. $m^y x^y = b^{y \log mx}$.
15. $\frac{a^{\log x} c^{\log y}}{m^{\log x} n^{\log y}} = x^{\log \frac{a}{m}} y^{\log \frac{c}{n}}$.