1999 Paper 1 Question 2

Discrete Mathematics

Let $M_n = 2^n - 1$ be the n^{th} Mersenne number.

Show that M_n can be prime only if n is. [5 marks]

Let $\Delta_m = m(m+1)/2$ be the m^{th} triangular number and recall that a perfect number is one equal to the sum of its factors (including 1 but excluding the number itself).

Suppose that $p = M_n$ is prime. Show that Δ_p is a perfect number. [5 marks]