Exercise 1. Show that

$$\sum_{n=1}^{\infty} \frac{\mu(n)}{n^s} = \frac{1}{\zeta(s)}$$

for all $s > 1$, where $\zeta(s) = \sum_{m=1}^{\infty} \frac{1}{m^s}$. Hint: multiply the series in question by $\zeta(s)$.

Exercise 2. Find a general formula for $\sigma_s(p^r)$, where $p$ is a prime, $r$ is a positive integer, $s$ is an integer, and

$$\sigma_s(n) = \sum_{d|n, \ d \geq 1} d^s.$$ 

Exercise 3. Find formulas $\sigma \ast \phi$, $\mu \ast \tau$ and $\mu \ast \sigma$ in terms of the following functions:

$I(n) = \begin{cases} 1 & \text{if } n = 1, \\ 0 & \text{otherwise}, \end{cases}$

$U(n) = 1$ for all $n$,

$E(n) = n$ for all $n$. 