(1) For the following, write \( \exp(x) \) instead of \( e^x \) for ease of reading the superscript. \( F(x) = \sum_{n \geq 0} f_n x^n \) is a formal power series that satisfies the following identity:
\[
F(x) = \exp\left(\frac{x}{2}(F(x) + 1)\right).
\]
Find a formula for \( f_n \).

(2) Draw the Hasse diagram of the following posets:
   (a) Set partitions of \([4]\).
   (b) Divisors of 120.

(3) Compute the Möbius function for all pairs of elements \( \mu(x, y) \) (you don’t need to list out the cases when \( x = y \)) of the following poset whose Hasse diagram is drawn below:

(4) How many necklaces are there of length \( n \) using \( k \) different colors for the beads where \( n \) is:
   (a) 8
   (b) 12
   (c) 30
Hints:
1: Consider $A(x) = x(F(x) + 1)$