Problem 1.
(a) How many functions are there from \{1, 2, 3\} to \{1, 2, 3, 4\}?
(b) Of these, how many are not one-to-one?
(c)

Problem 2. For the following Hasse diagram:
(a) find the associated parital order (answer in terms of ordered pairs).
(b) If they exist, what are the maximum and minimum elements.

Problem 3. Consider
\[
R = \begin{array}{ccc}
1 & * & * \\
2 & * & * & * \\
3 & * & * & * & *
\end{array}
\]
(a) Is \(R\) reflexive? Say why, of course.
(b) Is \(R\) transitive? Say why, of course.

Problem 4. You can check that
\[89 \times 21 - 34 \times 55 = -1.\]
(a) What is \(\text{GCD}(21, 55)\)?
(b) Find all integers that solve
\[
x \equiv 3 \pmod{21} \\
x \equiv 2 \pmod{55}
\]
Problem 5.

(a) Which of the following are bipartite?
Problem 6. Show that the following two graphs are isomorphic:

Problem 7. Find the closed-form solution to
\[ a_0 = 10, \quad a_1 = 12, \]
\[ a_n = 6a_{n-1} - 8a_{n-2} \]

Problem 8. For which natural numbers \( n \) is it true that
\[ 2^n \leq \frac{1}{3} n! \]
Be sure to verify your answer.

Problem 9. How many partitions are there of the set \( A = \{1, 2, 3, 4, 5\} \) into three nonempty sets?