CSE 2321 Homework 3 Template

1

- $|Pow(A)| = 16$
- $Pow(A) = \{\}, \{1\}, \{2\}, \{3\}, \{6\}, \{1,2\}, \{1,3\}, \{1,6\}, \{2,3\}, \{2,6\}, \{3,6\}, \{1,2,3\}, \{1,2,6\}, \{1,3,6\}, \{2,3,6\}, \{1,2,3,6\}$
- $|Pow(A \cup B)| = 32$
- $|Pow(A \cap B)| = 8$
- $Pow(A \setminus B) = \{\}, \{1\}$

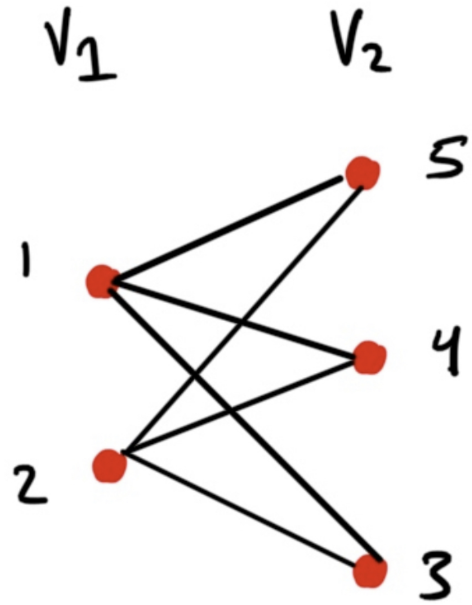
2

- The set of even numbers $= \{x \in \mathbb{N} : \exists y \in \mathbb{N}, x \div 2 = y\}$
- The set of prime numbers $= \{x \in \mathbb{N} : \exists a, b \in \mathbb{N}, (a \geq 1) \wedge (b \geq a), a * b = x \iff (a = 1) \wedge (b = x)\}$

3

$$
\begin{aligned}
A &= \{3, 4, 5, 6\} \\
B &= \{1, 2, 3, 4\} \\
X &= \{1, 2, 3, 4, 5, 6\} \\
Y &= \{4, 5, 6, 7, 8, 9\} \\
Z &= \{2, 4, 6\}
\end{aligned}
$$

4



5

4, 2, 3, 5, 4, 1, 3, 6, 4, 8, 3, 12, 4

6

$$\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$$

Proof By Induction.
Base Case:
Let n = 1
$\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$
$= \frac{1}{i(i+1)} = \frac{1}{1(1+1)} = \frac{1}{2}$
$= \frac{1}{i+1} = \frac{n}{n+1}$

Induction Step:
Let n be an arbitrary number and assume,

$\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$, so

$\sum_{i=1}^{n+1} \frac{1}{i(i+1)} = \frac{n+1}{n+1+1}$, so

$\sum_{i=1}^{n+1} \frac{1}{i(i+1)} = \sum_{i=1}^{n} \frac{1}{i(i+1)} + \frac{n+1}{(n+1)(n+1+1)}$

$= \frac{n}{n+1} + \frac{n+1}{(n+1)(n+2)} = \frac{n(n+2)+(n+1)}{(n+1)(n+2)}$

$= \frac{n}{n+1} + \frac{1}{n+2}$
$= \sum_{i=1}^{n} \frac{1}{i(i+1)} + \frac{1}{n+2}$

Conclusion:

□

$\sum_{i=1}^{n} \frac{1}{i(i+1)} = \frac{n}{n+1}$