

1. (10 points) Let $X = \{1, 2, \dots, 10\}$. Define a relation R on $X \times X$ by $(a, b)R(c, d)$ if $a + d = b + c$.

(a) Show that R is an equivalent relation on $X \times X$.

(b) List the equivalent class of $X \times X$ which contains $(2, 4)$.

2. (10 points)

(a) Find a theta notation for the number of $x = x + 1$ is executed.

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i=2
while (i<n) {
  i=i^2
  x=x+1
}

```

(b) Show that $n^{n+1} = O(3^{n^2})$. (hint: $x = a^{\log_a x}$, $a > 0$.)

3. Find the length of a shortest path and a shortest path between vertexes a and z in the weighted graph.

