

MATH 290 – 24 JUNE 2009 – EXAM 3

Answer all of the following questions on the answer sheets provided. Show all work, as partial credit may be given.

1. (8 pts.) Enumerate $\mathcal{P}(A)$, the power set of A , if $A = \{0, \{1\}, \{1, 2\}\}$.
2. (8 pts.) Prove that if $A \subseteq B$ then $\mathcal{P}(A) \subseteq \mathcal{P}(B)$.
3. (10 pts.) Use mathematical induction to prove that for all positive integers $n \geq 1$,

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

4. (12 pts.) Prove that for any sets A and B , $(A - B) \cup (B - A) = (A \cup B) - (A \cap B)$.
5. (12 pts.) For each integer $n \geq 1$, let $A_n = \left(-\frac{1}{n}, 1 + \frac{1}{n}\right)$. Prove that $\bigcup_{n=1}^{\infty} A_n = (-1, 2)$ and that $\bigcap_{n=1}^{\infty} A_n = [0, 1]$.