Assignment 7

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Papoulis ch2 problem 2.2

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Problem

If $A = \{2 \leq x \leq 5\}$ and $B = \{3 \leq x \leq 6\}$, find :

1. A + B
2. AB and
3. $(A + B)(AB)$'

Solution

If $A = \{2 \leq x \leq 5\}$, $B = \{3 \leq x \leq 6\}$, $S = \{-\infty < x < \infty\}$ then

1. $A + B = \{2 \leq x \leq 6\}$

2. $AB = \{3 \leq x \leq 5\}$

3. From (2) and
$$\because (AB)' = S - (AB)$$
$$\implies (AB)' = \{-\infty < x < \infty\} - \{3 \leq x \leq 5\}$$
$$\implies (AB)' = \{\{x < 3\} + \{x > 5\}\}$$

$$Now, (A + B)(AB)' = \{2 \leq x \leq 6\}\{\{x < 3\} + \{x > 5\}\} \quad (1)$$
$$= \{2 \leq x < 3\} + \{5 < x \leq 6\} \quad (2)$$

Graph

The graphs plotted via matplotlib verifies the solution :-
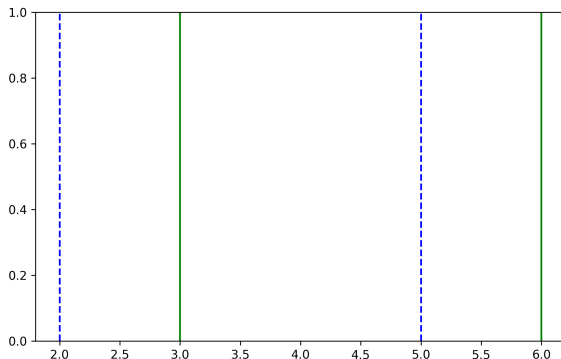Here , $A = \{2 \leq x \leq 5\} = blue$ and $B = \{3 \leq x \leq 6\} = green$

Figure: Graph of A and B

Graph

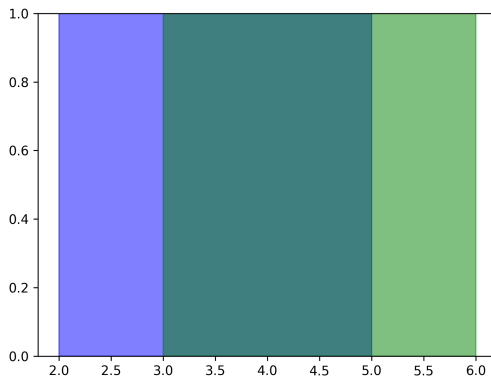$(A + B) = (blue + darkgreen + green)$, AB = dark green

Figure: Colored region of A + B

CODES

Python

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