MATH 130A Review: Algebra of Sets

1. If the universal set is given by \( U = \{0, 1, e, \pi, i\} \), and \( A = \{0, 1, e\} \), \( B = \{\pi, i\} \) are two subsets, find the following sets:
   
   (a) \( A \cup B \)
   (b) \( A \cap B \)
   (c) \( A^c \)
   (d) \( B^c \)

   Solution:
   
   (a) \( A \cup B = U \)
   (b) \( A \cap B = \emptyset \)
   (c) \( A^c = B \)
   (d) \( B^c = A \)

2. If the universal set is given by \( U = (-\infty, +\infty) = \mathbb{R} \), and \( A = [1, 2] \cup [3, 4], B = [2, 3] \) are two subsets, find the following sets:

   (a) \( A \cup B \)
   (b) \( A \cap B \)
   (c) \( A^c \)
   (d) \( B^c \)

   Solution:
   
   (a) \( A \cup B = [1, 4] \)
   (b) \( A \cap B = \{2, 3\} \)
   (c) \( A^c = (-\infty, 1) \cup (2, 3) \cup (4, +\infty) \)
   (d) \( B^c = (-\infty, 2) \cup (3, +\infty) \)