Thus \( p(A) \in p(B) \) \( \rightarrow A \in B \).

Thus \( \exists x \in B \), thus \( x \in A \). Thus \( A \neq \emptyset \).

Let \( x \in A \), then \( \exists y \in A \). Then \( x \in (A \cup B) \). Since \( (A \cup B) \in p(C) \), then \( x \in p(C) \). Thus \( p(A) \in p(C) \).

Let \( x \in p(A) \), then \( x \in p(C) \). Since \( A \in B \), then \( x \in B \). Therefore \( A \in B \).

Let \( p(A) \in p(B) \). Assume \( A \in B \).

Use fact: \( x \in A \Leftrightarrow x \in p(A) \).

Thus \( A \in B \).
(6) \((A \cup B) \cap (A \cap B) = A \cup (B \cap B) = A \cup \emptyset = A\)

Alternatively, show \(A - B \cap A = A \cup B = A - B\)
\[ A - B = \{ x \in A \text{ and } x \not\in B \} = \{ x \in A \} \text{ or } x \in B \Rightarrow A \cup B = A - B \]

19. (a) \(A \cup B = \emptyset\)

This supposes \(\forall A \in B\). We can reverse every arrow in the argument above, thus yielding

Thus suppose \(x \in A \cup B \Rightarrow x \in x \in A \cup B \Rightarrow x \in A \lor x \in B \Rightarrow \emptyset \Rightarrow x\),

\((b) A \cup A = A\)

This is part of Prove it (b),
\[ A \cup A = A \]
\[ A \cup A \]

\[(c) A \cup \emptyset = A \]

\[ A \cup \emptyset = A \]

\[(d) B - A = \{ 0, 6 \}\]

\[ B - A = \{ 0, 6 \}\]

\[(e) A - B = \{ 1, 3, 4 \} \]

\[ A - B = \{ 1, 3, 4 \} \]

\[(f) B \cap A = \{ 3 \} \]

\[ B \cap A = \{ 3 \} \]

\[(g) A \cup B = \{ 0, 1, 2, 3, 4, 5, 6 \} \]

\[ A \cup B = \{ 0, 1, 2, 3, 4, 5, 6 \} \]

\[(h) \partial A = \{ 0, 2 \}, 1, 5, 7 \]

\[ \partial A = \{ 0, 2 \}, 1, 5, 7 \]
2. a) \( f: \mathbb{R} \to \mathbb{R}^+ \) given by \( f(x) = x^2 \). Not a function, since \( n \) maps to two values. \( r \in \mathbb{R} \)  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x \). Not a function. \( f(x) = x \) is not a bijection. \( f(x) = x \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x \). Not a function. \( f(x) = x \) is not a bijection. \( f(x) = x \) is a bijection.  

3. a) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = 1/x \). Not a function. \( f(x) = 1/x \) is not a bijection. \( f(x) = 1/x \) is a bijection.  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  

4. a) \( f: \mathbb{R} \to \mathbb{R}^+ \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^3 \). Not a function. \( f(x) = x^3 \) is not a bijection. \( f(x) = x^3 \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 + 1 \). Not a function. \( f(x) = x^2 + 1 \) is not a bijection. \( f(x) = x^2 + 1 \) is a bijection.  

5. a) \( f: \mathbb{R} \to \mathbb{R}^+ \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^3 \). Not a function. \( f(x) = x^3 \) is not a bijection. \( f(x) = x^3 \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 + 1 \). Not a function. \( f(x) = x^2 + 1 \) is not a bijection. \( f(x) = x^2 + 1 \) is a bijection.  

6. a) \( f: \mathbb{R} \to \mathbb{R}^+ \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^3 \). Not a function. \( f(x) = x^3 \) is not a bijection. \( f(x) = x^3 \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 + 1 \). Not a function. \( f(x) = x^2 + 1 \) is not a bijection. \( f(x) = x^2 + 1 \) is a bijection.  

7. a) \( f: \mathbb{R} \to \mathbb{R}^+ \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^3 \). Not a function. \( f(x) = x^3 \) is not a bijection. \( f(x) = x^3 \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 + 1 \). Not a function. \( f(x) = x^2 + 1 \) is not a bijection. \( f(x) = x^2 + 1 \) is a bijection.  

8. a) \( f: \mathbb{R} \to \mathbb{R}^+ \) given by \( f(x) = x^2 \). Not a function. \( f(x) = x^2 \) is not a bijection. \( f(x) = x^2 \) is a bijection.  
   b) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^3 \). Not a function. \( f(x) = x^3 \) is not a bijection. \( f(x) = x^3 \) is a bijection.  
   c) \( f: \mathbb{R} \to \mathbb{R} \) given by \( f(x) = x^2 + 1 \). Not a function. \( f(x) = x^2 + 1 \) is not a bijection. \( f(x) = x^2 + 1 \) is a bijection.