





1.  $\int_{-\infty}^{\infty} \delta(x) dx = 1$ ,  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$

2. "Dirac delta function" is a generalized function.

3. The Dirac delta function is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

4. The Dirac delta function is a linear functional on the space of test functions.

- (1)  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$
- (2)  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ ,  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$
- (3)  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$
- (4)  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$

5. The Dirac delta function is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

6. The Dirac delta function is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

7. The Dirac delta function is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

8. "Dirac delta function" is a generalized function, which is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

9. The Dirac delta function is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

10. The Dirac delta function is a linear functional on the space of test functions. It is defined by the property that its integral with any test function  $f(x)$  is equal to the value of the function at the origin:  $\int_{-\infty}^{\infty} \delta(x) f(x) dx = f(0)$ .

1. 定义 1.1.1 设  $f: X \rightarrow Y$  为映射,  $A \subset X$ ,  $B \subset Y$ . 则  $f(A) = \{y \in Y \mid \exists x \in A, f(x) = y\}$  称为  $A$  在  $f$  下的象,  $f^{-1}(B) = \{x \in X \mid \exists y \in B, f(x) = y\}$  称为  $B$  在  $f$  下的原象.

2. 定义 1.1.2 设  $f: X \rightarrow Y$  为映射,  $A, A' \subset X$ ,  $B, B' \subset Y$ . 则  $f(A \cup A') = f(A) \cup f(A')$ ,  $f(A \cap A') \subset f(A) \cap f(A')$ ,  $f^{-1}(B \cup B') = f^{-1}(B) \cup f^{-1}(B')$ ,  $f^{-1}(B \cap B') = f^{-1}(B) \cap f^{-1}(B')$ .

3. 定义 1.1.3 设  $f: X \rightarrow Y$  为映射,  $A \subset X$ . 则  $f$  在  $A$  上的限制  $f|_A: A \rightarrow Y$  定义为  $f|_A(x) = f(x)$ . 若  $f$  为单射, 则  $f|_A$  也是单射. 若  $f$  为满射, 则  $f|_A$  不一定是满射. 若  $f$  为双射, 则  $f|_A$  不一定是双射.

4. 定义 1.1.4 设  $f: X \rightarrow Y$  为映射,  $A \subset X$ . 则  $f$  在  $A$  上的限制  $f|_A$  的象  $f|_A(A) = f(A)$ .

5. 定理 1.1.1 设  $f: X \rightarrow Y$  为映射,  $A, A' \subset X$ ,  $B, B' \subset Y$ . 则  $f^{-1}(f(A)) \supset A$ ,  $f^{-1}(f(A \cap A')) \supset A \cap A'$ ,  $f^{-1}(f^{-1}(B)) \supset B$ ,  $f^{-1}(f^{-1}(B \cap B')) \supset B \cap B'$ .

6. 定理 1.1.2 设  $f: X \rightarrow Y$  为映射,  $A, A' \subset X$ ,  $B, B' \subset Y$ . 则  $f(A \cap A') \subset f(A) \cap f(A')$ ,  $f^{-1}(B \cap B') = f^{-1}(B) \cap f^{-1}(B')$ ,  $f^{-1}(f^{-1}(B)) = f^{-1}(B)$ .

证

7. 定理 1.1.3 设  $f: X \rightarrow Y$  为映射,  $A, A' \subset X$ ,  $B, B' \subset Y$ . 则  $f^{-1}(f(A \cap A')) \supset A \cap A'$ ,  $f^{-1}(f(A) \cap f(A')) \supset A \cap A'$ ,  $f^{-1}(f^{-1}(B) \cap f^{-1}(B')) \supset B \cap B'$ .

...  
...  
...  
...

...  
...  
...

...  
...  
...  
...  
...  
...

...  
...  
...

...  
...  
...  
...  
...  
...

...  
...  
...  
...  
...

...  
...  
...  
...  
...

...  
...  
...  
...  
...

...  
...  
...  
...  
...

2 2 2 0 0

---

U  
.....

0 2 2

---

.....  
.....

---

.....  
.....