

Step-1

We have to verify which of the given transformations are invertible.

a) Given transformation is $T(x) = x^3$.

Let $x^3 = b$

$$\Rightarrow x = b^{\frac{1}{3}}$$

$$\text{Now } T\left(b^{\frac{1}{3}}\right) = b$$

$$\Rightarrow T^{-1}(b) = b^{\frac{1}{3}}, \quad b \in \mathbb{R}$$

Hence $\boxed{T(x) = x^3}$ is invertible.

Step-2

(b) Given transformation is $T(x) = e^x$.

Suppose $T(x) = y$

$$\Rightarrow e^x = y$$

$$\Rightarrow x \log_e e = \log_e y$$

$$\Rightarrow x = \log_e y$$

We know that the logarithms are not defined for negative values

Hence the given transformation T is not invertible.

Step-3

(c) Given transformation is $T(x) = x + 11$.

Let $T(x) = y$

$$\Rightarrow x + 11 = y$$

$$\Rightarrow x = y - 11$$

$$\Rightarrow T^{-1}(y) = y - 11$$

Hence $\boxed{T(x) = x + 11}$ is invertible.

Step-4

(d) Given transformation is $T(x) = \cos x$.

Let $T(x) = y$

$$\cos x = y$$

If $y = 2$, there is no x in \mathbf{R} such that $\cos x = 2$

Hence T is not invertible.