

**Topic:** Functions and transformations

**Question:** The transformation  $T$  maps every vector in  $\mathbb{R}^2$  to every vector in  $\mathbb{R}^3$ . What are the domain, codomain, and range of  $T$ ?

**Answer choices:**

- A The domain is  $\mathbb{R}^2$ , the codomain is  $\mathbb{R}^2$ , and the range is  $\mathbb{R}^2$
- B The domain is  $\mathbb{R}^3$ , the codomain is  $\mathbb{R}^3$ , and the range is  $\mathbb{R}^3$
- C The domain is  $\mathbb{R}^2$ , the codomain is  $\mathbb{R}^3$ , and the range is  $\mathbb{R}^3$
- D The domain is  $\mathbb{R}^2$ , the codomain is  $\mathbb{R}^3$ , and the range is  $\mathbb{R}^2$



**Solution: C**

The domain is the space  $T$  is mapping *from*, so the domain is  $\mathbb{R}^2$ .

The codomain is the space  $T$  is mapping *to*, so the codomain is  $\mathbb{R}^3$ .

The range is the specific set of vectors within the codomain that are being mapped to. Because every vector in  $\mathbb{R}^3$  is being mapped to, the range is  $\mathbb{R}^3$ .



**Topic:** Functions and transformations

**Question:** The transformation  $T$  maps every vector in  $\mathbb{R}^4$  to the zero vector  $\vec{0}$  in  $\mathbb{R}^2$ . What are the domain, codomain, and range of  $T$ ?

**Answer choices:**

- A The domain is  $\mathbb{R}^4$ , the codomain is  $\mathbb{R}^2$ , and the range is  $\vec{v} = (0,0)$
- B The domain is  $\mathbb{R}^2$ , the codomain is  $\mathbb{R}^4$ , and the range is  $\vec{v} = (0,0)$
- C The domain is  $\mathbb{R}^4$ , the codomain is  $\vec{v} = (0,0)$ , and the range is  $\mathbb{R}^2$
- D The domain is  $\mathbb{R}^2$ , the codomain is  $\vec{v} = (0,0)$ , and the range is  $\mathbb{R}^4$



**Solution: A**

The domain is the space  $T$  is mapping *from*, so the domain is  $\mathbb{R}^4$ .

The codomain is the space  $T$  is mapping *to*, so the codomain is  $\mathbb{R}^2$ .

The range is the specific set of vectors within the codomain that are being mapped to, so the range is  $\overrightarrow{v} = (0,0)$ .



**Topic:** Functions and transformations

**Question:** The transformation  $T$  maps  $\vec{a} = (1, 2, -4)$  to  $\vec{b} = (-3, 0, 4)$ . What are the domain, codomain, and range of  $T$ ?

**Answer choices:**

- A The domain is  $\mathbb{R}^3$ , the codomain is  $\vec{a} = (1, 2, -4)$ , and the range is  $\mathbb{R}^3$
- B The domain is  $\mathbb{R}^3$ , the codomain is  $\mathbb{R}^3$ , and the range is  $\vec{a} = (1, 2, -4)$
- C The domain is  $\mathbb{R}^3$ , the codomain is  $\vec{b} = (-3, 0, 4)$ , and the range is  $\mathbb{R}^3$
- D The domain is  $\mathbb{R}^3$ , the codomain is  $\mathbb{R}^3$ , and the range is  $\vec{b} = (-3, 0, 4)$



**Solution: D**

The domain is the space  $T$  is mapping *from*, so the domain is  $\mathbb{R}^3$ .

The codomain is the space  $T$  is mapping *to*, so the codomain is  $\mathbb{R}^3$ .

The range is the specific set of vectors within the codomain that are being mapped to, so the range is  $\vec{b} = (-3, 0, 4)$ .

