

A3.2

Let $A \xrightarrow{T} B$
 $A \xrightarrow{T} B$ = denote frame transformation from A to B.

Since frame transformation is same as point transformation,

$A \xrightarrow{T} B$ = point transformation from frame B to frame A

Also, since $A \xrightarrow{T} B = (B \xrightarrow{T} A)^{-1}$ (By defn of transformation matrix -)

Given: $A \xrightarrow{T} B, B \xrightarrow{T} C, C \xrightarrow{T} D, A \xrightarrow{T} E$

Reqd: $D \xrightarrow{T} E$

By defn of point transformation, we know;

$$A \xrightarrow{T} E = A \xrightarrow{T} B \xrightarrow{T} C \xrightarrow{T} D \xrightarrow{T} E$$

if a point in frame E is multiplied with this, we will get its coordinates in frame A

$$\rightarrow D \xrightarrow{T} E = D \xrightarrow{T} E = (C \xrightarrow{T} D)^{-1} (B \xrightarrow{T} C)^{-1} (A \xrightarrow{T} B)^{-1} A \xrightarrow{T} E$$

$$\rightarrow D \xrightarrow{T} E = D \xrightarrow{T} E = \boxed{D \xrightarrow{T} C (B \xrightarrow{T} C)^{-1} (A \xrightarrow{T} B)^{-1} A \xrightarrow{T} E}$$

Ans.

~~Point~~ point X 's coordinates in frame of $D = P_D$

Then,

$$P_E = {}^E T_D P_D$$

$$\Rightarrow P_E = \left({}^D T_E \right)^{-1} P_D$$

↓
This is known from answer of previous question