For $n \times n$ matrices $A$ and $B$, and $n \times 1$ column matrices $C$, $D$, and $X$, solve the following matrix equation assuming that all necessary inverses exist:

$$AX + C = BX + D.$$ 

**Solution:** Subtracting $C + BX$ from both sides, we obtain

$$AX - BX = D - C.$$ 

By the distributive property, the left hand side is equal to $(A - B)X$, so

$$(A - B)X = D - C.$$ 

Assuming $A - B$ is invertible, we can multiply both sides by $(A - B)^{-1}$:

$$(A - B)^{-1}(A - B)X = (A - B)^{-1}(D - C),$$ 

$$IX = (A - B)^{-1}(D - C),$$ 

$$X = (A - B)^{-1}(D - C),$$ 

since $IX = X$. 