classmate

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#8: Let $T: \mathbb{C}(\mathbb{R}) \to \mathbb{C}(\mathbb{R})$ be a map and $\mathbb{F} = \mathbb{R}$. Then which of the foll is/are linear transformation.

Ⓐ ✓ $T(z) = \bar{z}$

Ⓑ ✓ $T(z) = z$

Ⓓ ✓ $T(z) = 0$

$T(\alpha z_1 + z_2) = \overline{\alpha z_1 + z_2}$

$= \alpha \bar{z}_1 + \bar{z}_2$

$\alpha T(z_1) + T(z_2) = \alpha \bar{z}_1 + \bar{z}_2$

Ⓒ ✗ $T(z) = z + i$

$T(\alpha z_1 + z_2) = \alpha z_1 + z_2 + i$

$\alpha T(z_1) + T(z_2) = \alpha(z_1 + i) + z_2 + i = \alpha z_1 + z_2 + \alpha i + i$

#9: Let $T: P_n(\mathbb{R}) \to P_n(\mathbb{R})$ be a map and $\mathbb{F} = \mathbb{R}$. Then which of the foll. is/are l.t.

Ⓐ ✓ $T(P(x)) = P'(x)$

$T(\alpha P(x) + Q(x)) = \alpha P'(x) + Q'(x) = \alpha T(P(x)) + T(Q(x))$

Ⓑ ✓ $T(P(x)) = P'(0)$

Ⓒ $T(P(x)) = \int_0^x P(x)\,dx$

$T(\alpha P(x) + Q(x)) = \int_0^x (\alpha P + Q)\,dx = \int_0^x \alpha P\,dx + \int_0^x Q\,dx$

$\because T(x^n) = \int_0^x x^n\,dx = \left.\frac{x^{n+1}}{n+1}\right|_0^x = \frac{x^{n+1}}{n+1} \notin P_n(\mathbb{R})$