(6) is $\frac{df}{dx}$ a linear transformation

(i) $L(f(x) + g(x))$

$= \frac{d}{dx}(f(x) + g(x)) = \frac{d}{dx}(f(x) + \frac{d}{dx}(g(x))$

$= L(f(x) + L(g(x))$

(ii) $\frac{d}{dx}(af(x)) = a\frac{d}{dx}f(x) = aL(f(x))$

Hence $\frac{df}{dx}$ is a linear transformation.