Are the following functions continuous? (Prove your answer)

1. $F_1 : C([a, b]) \to \mathbb{R}$ defined by $f \mapsto \int_a^b f(t)\,dt$, where $C([a, b])$ denotes the set of continuous functions on the bounded interval $[a, b]$, and is endowed with the norm $\| \cdot \|_\infty$.

2. $F_2 : C([a, b]) \to \mathbb{R}$ defined by $f \mapsto \max_{[a,b]} |f(t)|$, where $C([a, b])$ is endowed with the norm $\| \cdot \|_1$.

3. $F_3 : D([a, b]) \to C([a, b])$ defined by $f \mapsto f'$, where $D([a, b])$ denotes the set of differentiable functions on $[a, b]$ (note that $D([a, b]) \subseteq C([a, b])$). Consider the four cases where each space is endowed with the norm $\| \cdot \|_1$ or $\| \cdot \|_\infty$. (For simplicity you can produce examples which are only piecewise differentiable).