Q1: Let $(g, e) \in G \times \{e\}$. Let $h = (h, h') \in P$. We compute that

$$h(g, e)h^{-1} = (h, h')(g, e)(h^{-1}, h'^{-1}) = (hg, h')(h^{-1}, h'^{-1}) = (hgh^{-1}, e)$$

Which is clearly an element of $G \times \{e\}$. We now claim that $G \times \{e\}$ is isomorphic to G'. Consider the map $\phi : P \to G'$ defined by $\phi(g, g') = g'$. This will have a kernel of $G \times \{e\}$ and is clearly surjective onto $G\prime$. Hence by the first isomorphism theorem, there exists an isomorphism from $G \times G'/G \times \{e\}$ to G'.