Given the vector field $F(x, y, z) = (y, x, 1)$

A) Prove that $F$ is path independent in $\mathbb{R}^3$ by finding a potential function for $F$.

B) If $C$ is a path in $\mathbb{R}^3$ parametrized by $c(t) = \left(\frac{t^4}{4}, \sin^3\frac{t\pi}{2}, t\right)$ with $0 \leq t \leq 1$ calculate the path integral $\int_C \mathbf{F} \cdot d\mathbf{x}$.  
