MATH 3D Prep: Integrals Involving Extra Variable

1. Find a function $f(x)$ such that $f'(x) = \sin(x^2)$ and $f(\pi) = 1$
2. Use the identity

$$\cos\theta \sin\varphi = \frac{1}{2}[\sin(\theta + \phi) - \sin(\theta - \phi)]$$

to evaluate the integral $\int_0^\pi \sin(t)\cos(x - t)dt$.