Question

Determine whether the differential equation

$$x \sin t \frac{dx}{dt} + t \sin x = 0$$

is exact, and, if so, find the general solution.

Answer

Consider $x \sin t \dfrac{dx}{dt} + t \sin x = 0$

$\dfrac{\partial}{\partial t}[x \sin t] = x \cos t \qquad \dfrac{\partial}{\partial x}[t \sin x] = t \cos x$

$x \cos t \neq t \cos x$ therefore equation is NOT exact.