A

$\vec{F}(x, y) = \langle -y \sin x + 2x, \cos x \rangle$

$\frac{\partial F_1}{\partial y} = -\sin x$
$\frac{\partial F_2}{\partial x} = -\sin x$

Since $\frac{\partial F_1}{\partial y} = \frac{\partial F_2}{\partial x}$, this means that the vector field is conservative

B

$\int -y \sin x + 2x \, dx$
$= y \cos x + x^2 + C$

$\int \cos x \, dy$
$= y \cos x + C$

$f(x, y) = y \cos x + x^2 + C$

C

Since $\vec{F}$ is conservative, a line integral on R^2 of $\vec{F}$ is equivalent to the difference in the potential function of the beginning and end of the curve.

$a = (0, -1)$
$b = (3, 0)$

$\int_C \vec{F}(x, y) \, d\vec{r}$

$= f(3, 0) - f(0, -1) = 9 - -1 = 10$