$$
\begin{aligned}
\int_C xe^{-5x}\,dx + (x^4 + 2x^2y^2)\,dy &= \iint_D \left[\tfrac{\partial}{\partial x}\left(x^4 + 2x^2y^2\right) - \tfrac{\partial}{\partial y}\left(xe^{-5x}\right)\right] dA \\
&= \iint_D (4x^3 + 4xy^2 - 0)\,dA \\
&= 4\iint_D x(x^2 + y^2)\,dA \\
&= 4\int_0^{2\pi}\int_1^{10} (r\cos\theta)(r^2)\,r\,dr\,d\theta \\
&= 4\int_0^{2\pi} \cos\theta\,d\theta \int_1^{10} r^4\,dr \\
&= 4[\sin\theta]_0^{2\pi}\left[\tfrac{1}{5}r^5\right]_1^{10} = 0
\end{aligned}
$$