

$$\begin{aligned}
\oint \mathbf{F} \cdot d\mathbf{r} &= \int_R^{2R} F_x(x, 2R) dx + \int_{2R}^R F_y(2R, y) dy \\
&+ \int_{2R}^R F_x(x, R) dx + \int_R^{2R} F_y(R, y) dy \\
&= -\frac{U_0(2R)^2}{R^4} (4R^2 - R^2) - \frac{U_0(2R)^2}{R^4} (R^2 - 4R^2) \\
&- \frac{U_0R^2}{R^4} (R^2 - 4R^2) - \frac{U_0R^2}{R^4} (4R^2 - R^2) \\
&= 0
\end{aligned}$$