

$$\begin{aligned}
E_\epsilon[f_W] &\approx \frac{1}{\epsilon} \int_0^W \frac{1}{4} \, dx + \epsilon \int_0^W \frac{4}{W^2} \, ds \\
&= \frac{W}{4\epsilon} + \frac{4\epsilon}{W}
\end{aligned}$$