Vector Fields
Conservative Fields

Question
Calculate $\nabla \ln |\underline{r}|$, with $\underline{r} = x\underline{i} + y\underline{j} + z\underline{k}$.
Answer

$$\begin{aligned}
\frac{\partial}{\partial x} \ln |\underline{r}| &= \frac{1}{|\underline{r}|} \frac{\underline{r} \bullet \frac{\partial \underline{r}}{\partial x}}{|\underline{r}|} = \frac{x}{|\underline{r}|^2} \\
\nabla \ln |\underline{r}| &= \frac{x\underline{i} + y\underline{j} + z\underline{k}}{|\underline{r}|^2} \\
&= \frac{\underline{r}}{|\underline{r}|^2}
\end{aligned}$$