$f(x,y) = 7\ln(x^2+y^2) \quad \Rightarrow \quad \nabla f(x,y) = \left\langle \dfrac{14x}{x^2+y^2}, \dfrac{14y}{x^2+y^2} \right\rangle$,
$\nabla f(4,5) = \left\langle \frac{56}{41}, \frac{70}{41} \right\rangle$, and a unit vector in the direction of $\mathbf{v} = \langle -5, 4 \rangle$ is
$\mathbf{u} = \dfrac{1}{\sqrt{25+16}} \langle -5, 4 \rangle = \left\langle -\frac{5}{\sqrt{41}}, \frac{4}{\sqrt{41}} \right\rangle$, so
$D_{\mathbf{u}} f(4,5) = \nabla f(4,5) \cdot \mathbf{u} = \left\langle \frac{56}{41}, \frac{70}{41} \right\rangle \cdot \left\langle -\frac{5}{\sqrt{41}}, \frac{4}{\sqrt{41}} \right\rangle = -\frac{280}{41\sqrt{41}} + \frac{280}{41\sqrt{41}} = 0.$