1.3.1 Calculate the work required to move a mass m against a force field $\mathbf{F} = 5\mathbf{u_x} + 7\mathbf{u_y}$ along the indicated direct path from point a to point b. *Note: Diagram not shown.*

By inspection of the diagram, the start and end points are $a = (0, 1)$ and $b = (5, 5)$. To find the work required to move along the path between the points, we need to compute the path integral of the force field.

$$
\begin{aligned}
W_{ab} &= \int_a^b \mathbf{F} \bullet \mathbf{dl} \\
&= \int_a^b (5\mathbf{u_x} + 7\mathbf{u_y}) \bullet (dx\mathbf{u_x} + dy\mathbf{u_y}) \\
&= \int_a^b 5dx + \int_a^b 7dy \\
&= \int_{x=0}^5 5dx + \int_{y=1}^5 7dy \\
&= 5x\big|_0^5 + 7y\big|_1^5 \\
&= (25 - 0) + (35 - 7) \\
&= 53
\end{aligned}
$$