Derive the Maxwell relation that follows from: $dg = -sdT + vdP$

$dg = \left(\frac{\partial g}{\partial T}\right)_P dT + \left(\frac{\partial g}{\partial P}\right)_T dP$ results from $dg = -sdT - vdP$

where $-s = \left(\frac{\partial g}{\partial T}\right)_P$ and $v = \left(\frac{\partial g}{\partial P}\right)_T$

$\frac{\partial^2 g}{\partial P \partial T} = \left(\frac{\partial}{\partial P}\left(\frac{\partial g}{\partial T}\right)_P\right)_T = -\left(\frac{\partial s}{\partial P}\right)_T$

$\frac{\partial^2 g}{\partial T \partial P} = \left(\frac{\partial}{\partial T}\left(\frac{\partial g}{\partial P}\right)_T\right)_P = \left(\frac{\partial v}{\partial T}\right)_P$

$\frac{\partial^2 g}{\partial P \partial T} = \frac{\partial^2 g}{\partial T \partial P} \rightarrow -\left(\frac{\partial s}{\partial P}\right)_T = \left(\frac{\partial v}{\partial T}\right)_P$

Correct: $\left(\frac{\partial s}{\partial P}\right)_T = -\left(\frac{\partial v}{\partial T}\right)_P$