

13.2, number 9: **Evaluate** $\int_0^{\pi/2} [\cos t \vec{i} - 2 \sin 2t \vec{j} + \sin^2 t \vec{k}] dt$.

Answer: The integral is equal to

$$\begin{aligned} & (\sin t \vec{i} + \cos 2t \vec{j} + \frac{1}{2} \int (1 - \cos 2t) dt) \vec{k} \Big|_0^{\pi/2} \\ &= (\sin t \vec{i} + \cos 2t \vec{j} + \frac{1}{2}(t - \frac{\sin 2t}{2})) \vec{k} \Big|_0^{\pi/2} \\ &= \vec{i} - \vec{j} + \frac{1}{2}(\frac{\pi}{2}) \vec{k} - (0 \vec{i} + 0 \vec{j}) \\ &= \boxed{\vec{i} - \vec{j} + \frac{\pi}{4} \vec{k}} \end{aligned}$$