8. We use a u-substitution.

$u = 2x$ $\qquad V = \pi \int_0^{\frac{\pi}{4}} (\cos 2x)^2 dx$

$du = 2dx$

$dx = \frac{du}{2}$

$= \frac{1}{2}\pi \int (\cos u)^2 du$. We use $\cos^2 u = \frac{1+\cos 2u}{2}$.

$= \frac{1}{2}\pi \int \frac{1+\cos 2u}{2} du$

$= \frac{1}{2}\pi \int \frac{1}{2} + \frac{\cos 2u}{2} du$

$= \frac{1}{4}\pi u + \frac{1}{8}\pi \sin 2u$ We substitute $u = 2x$ back in.

$= \frac{1}{2}\pi x + \frac{1}{8}\pi \sin 4x \Big]_0^{\frac{\pi}{4}}$

$= \frac{\pi^2}{8} + 0 - [0+0]$

$= \boxed{\frac{\pi^2}{8}}$