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$$\begin{aligned} \boxed{1} \quad & \int \cos^2(qx) dx \\ &= \int \frac{1 + \cos(2qx)}{2} dx = \frac{1}{2} \left(x + \frac{1}{2q} \sin(2qx) \right) + C = \frac{x}{2} + \frac{1}{4q} \sin(2qx) + C \end{aligned}$$

$$\begin{aligned} \boxed{2} \quad & \int_0^{\frac{\pi}{2}} \frac{x}{4} \cdot \frac{\cos x}{dx} dx = uv - \int v du \\ &= x \sin x - \int \sin x dx \\ &= x \sin x + \cos x \Big|_0^{\frac{\pi}{2}} \\ &= \left(\frac{\pi}{2} (1) + 0 \right) - (0 + 1) \\ &= \frac{\pi}{2} - 1 \end{aligned}$$

$$\begin{aligned} \boxed{3} \quad & \int 2 + 6 \cos^2(x) dx \\ &= 2 \int (1 + 3 \cos^2(x)) dx \\ &= 2x + 2 \int 3 \cos^2 x dx \\ &= 2x + 2 \int \frac{3 + 3 \cos 2x}{2} dx \\ &= 2x + 3 \int 1 + \cos 2x dx \\ &= 2x + 3x + 3 \left(\frac{1}{2} \sin 2x \right) \\ &= 5x + \frac{3}{2} \sin 2x + C \end{aligned}$$

$$\begin{aligned} u^2 + v^2 &= 1 \\ u^2 &= 1 - v^2 \end{aligned}$$