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$\frac{1}{2} \int_0^{\pi} \sin x dx = \frac{1}{2} [-\cos x]_0^{\pi} = \frac{1}{2} (-\cos \pi + \cos 0) = \frac{1}{2} (1 + 1) = 1$   
 $\int_0^{\pi} \sin x dx = [-\cos x]_0^{\pi} = -\cos \pi + \cos 0 = 1 + 1 = 2$   
 $\int_0^{\pi} \cos x dx = [\sin x]_0^{\pi} = \sin \pi - \sin 0 = 0 - 0 = 0$   
 $\int_0^{\pi} \sin^2 x dx = \int_0^{\pi} \frac{1 - \cos 2x}{2} dx = \frac{1}{2} [x - \frac{\sin 2x}{2}]_0^{\pi} = \frac{1}{2} (\pi - \frac{\sin 2\pi}{2}) = \frac{\pi}{2}$   
 $\int_0^{\pi} \cos^2 x dx = \int_0^{\pi} \frac{1 + \cos 2x}{2} dx = \frac{1}{2} [x + \frac{\sin 2x}{2}]_0^{\pi} = \frac{1}{2} (\pi + \frac{\sin 2\pi}{2}) = \frac{\pi}{2}$   
 $\int_0^{\pi} \sin x \cos x dx = \int_0^{\pi} \frac{\sin 2x}{2} dx = \frac{1}{4} [-\cos 2x]_0^{\pi} = \frac{1}{4} (-\cos 2\pi + \cos 0) = \frac{1}{4} (-1 + 1) = 0$   
 $\int_0^{\pi} \sin^3 x dx = \int_0^{\pi} \sin x (1 - \cos^2 x) dx = \int_0^{\pi} \sin x dx - \int_0^{\pi} \sin x \cos^2 x dx$   
 $= 2 - [\frac{\cos^3 x}{-3}]_0^{\pi} = 2 - [\frac{\cos^3 \pi}{-3} - \frac{\cos^3 0}{-3}] = 2 - [\frac{-1}{-3} - \frac{1}{-3}] = 2 - [\frac{1}{3} - \frac{1}{3}] = 2$   
 $\int_0^{\pi} \cos^3 x dx = \int_0^{\pi} \cos x (1 - \sin^2 x) dx = \int_0^{\pi} \cos x dx - \int_0^{\pi} \cos x \sin^2 x dx$   
 $= 0 - [\frac{\sin^3 x}{3}]_0^{\pi} = 0 - [\frac{\sin^3 \pi}{3} - \frac{\sin^3 0}{3}] = 0 - [0 - 0] = 0$   
 $\int_0^{\pi} \sin^4 x dx = \int_0^{\pi} \sin^2 x (1 - \cos^2 x) dx = \int_0^{\pi} \sin^2 x dx - \int_0^{\pi} \sin^2 x \cos^2 x dx$   
 $= \frac{\pi}{2} - \int_0^{\pi} \frac{\sin^2 2x}{4} dx = \frac{\pi}{2} - \frac{1}{8} \int_0^{\pi} (1 - \cos 4x) dx = \frac{\pi}{2} - \frac{1}{8} [x - \frac{\sin 4x}{4}]_0^{\pi} = \frac{\pi}{2} - \frac{1}{8} (\pi - \frac{\sin 4\pi}{4}) = \frac{\pi}{2} - \frac{\pi}{8} = \frac{3\pi}{8}$   
 $\int_0^{\pi} \cos^4 x dx = \int_0^{\pi} \cos^2 x (1 + \sin^2 x) dx = \int_0^{\pi} \cos^2 x dx + \int_0^{\pi} \cos^2 x \sin^2 x dx$   
 $= \frac{\pi}{2} + \int_0^{\pi} \frac{\sin^2 2x}{4} dx = \frac{\pi}{2} + \frac{1}{8} \int_0^{\pi} (1 - \cos 4x) dx = \frac{\pi}{2} + \frac{1}{8} [x - \frac{\sin 4x}{4}]_0^{\pi} = \frac{\pi}{2} + \frac{1}{8} (\pi - \frac{\sin 4\pi}{4}) = \frac{\pi}{2} + \frac{\pi}{8} = \frac{5\pi}{8}$   
 $\int_0^{\pi} \sin^5 x dx = \int_0^{\pi} \sin x (1 - \cos^2 x)^2 dx = \int_0^{\pi} \sin x (1 - 2\cos^2 x + \cos^4 x) dx$   
 $= \int_0^{\pi} \sin x dx - 2 \int_0^{\pi} \sin x \cos^2 x dx + \int_0^{\pi} \sin x \cos^4 x dx = 2 - [\frac{\cos^3 x}{-3}]_0^{\pi} + [\frac{\cos^5 x}{-5}]_0^{\pi}$   
 $= 2 - [\frac{\cos^3 \pi}{-3} - \frac{\cos^3 0}{-3}] + [\frac{\cos^5 \pi}{-5} - \frac{\cos^5 0}{-5}] = 2 - [\frac{-1}{-3} - \frac{1}{-3}] + [\frac{-1}{-5} - \frac{1}{-5}] = 2 - [\frac{1}{3} - \frac{1}{3}] + [\frac{1}{5} - \frac{1}{5}] = 2$   
 $\int_0^{\pi} \cos^5 x dx = \int_0^{\pi} \cos x (1 - \sin^2 x)^2 dx = \int_0^{\pi} \cos x (1 - 2\sin^2 x + \sin^4 x) dx$   
 $= \int_0^{\pi} \cos x dx - 2 \int_0^{\pi} \cos x \sin^2 x dx + \int_0^{\pi} \cos x \sin^4 x dx = 0 - [\frac{\sin^3 x}{3}]_0^{\pi} + [\frac{\sin^5 x}{5}]_0^{\pi} = 0 - [0 - 0] + [0 - 0] = 0$

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