Q. 4. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} \sin x \, dx = -\left[\cos x\right]_{\frac{\pi}{4}}^{\frac{\pi}{2}}$

$= -\left[\cos \frac{\pi}{2} - \cos \frac{\pi}{4}\right]$

$= \frac{1}{\sqrt{2}}$

Q. 5. $\int_{\ln 2}^{\ln 5} e^x \, dx = \left[e^x\right]_{\ln 2}^{\ln 5}$

$= e^{\ln 5} - e^{\ln 2}$

$= 5 - 2$

$= 3$

Q. 6. $2\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \cos x \, dx = 2\left[\sin x\right]_{\frac{\pi}{6}}^{\frac{\pi}{3}}$

$= 2\left[\sin \frac{\pi}{3} - \sin\frac{\pi}{6}\right]$

$= \sqrt{3} - 1$

Q. 7. $4\int_{0}^{\frac{\pi}{3}} \sin x \, dx = -4\left[\cos x\right]_{0}^{\frac{\pi}{3}}$

$= -4\left[\cos \frac{\pi}{3} - \cos 0\right]$

$= 2$

Q. 8. $\int_{0}^{\frac{\pi}{4}} (\cos x + \sin x) \, dx$

$= [\sin x - \cos x]_0^{\frac{\pi}{4}}$

$= \left(\sin \frac{\pi}{4} - \cos \frac{\pi}{4}\right) - (\sin 0 - \cos 0) = 1$

Q. 9. $\int_{\frac{\pi}{4}}^{\frac{\pi}{2}} (\cos x - \sin x) \, dx$

$= \left[\sin x + \cos x\right]_{\frac{\pi}{4}}^{\frac{\pi}{2}}$

$= \left(\sin \frac{\pi}{2} + \cos \frac{\pi}{2}\right) - \left(\sin \frac{\pi}{4} + \cos \frac{\pi}{4}\right)$

$= 1 - \sqrt{2}$

Q. 10. $\int_{2}^{4} \frac{dx}{\sqrt{16 - x^2}}$

$= \left[\sin^{-1}\frac{x}{4}\right]_2^4$

$= \sin^{-1}1 - \sin^{-1}\frac{1}{2}$

$= \frac{\pi}{2} - \frac{\pi}{6} = \frac{\pi}{3}$

Q. 11. $\int_{0}^{\ln 2} e^{3x} \, dx$

$= \frac{1}{3}\left[e^{3x}\right]_0^{\ln 2}$

$= \frac{1}{3}[e^{3 \ln 2} - e^0]$

$= \frac{1}{3}[e^{\ln(2)^3} - 1]$

$= \frac{1}{3}[e^{\ln 8} - 1] = \frac{1}{3}[8 - 1] = \frac{7}{3}$

Q. 12. $\int_{0}^{\frac{\pi}{16}} \cos 4x \, dx$

$= \frac{1}{4}\left[\sin 4x\right]_0^{\frac{\pi}{16}}$

$= \frac{1}{4}\left[\sin\left(\frac{\pi}{4}\right) - \sin 0\right]$

$= \frac{1}{4\sqrt{2}}$

Q. 13. $\int_{0}^{\frac{\pi}{6}} \sin 2x \, dx$

$= -\frac{1}{2}[\cos 2x]_0^{\frac{\pi}{6}}$

$= -\frac{1}{2}\left[\cos \frac{\pi}{3} - \cos 0\right]$

$= \frac{1}{4}$

Q. 14. $\int_{0}^{\frac{\pi}{6}} \cos 3x \, dx$

$= +\frac{1}{3}[\sin 3x]_0^{\frac{\pi}{6}}$

$= +\frac{1}{3}\left[\sin \frac{\pi}{2} - \sin 0\right]$

$= +\frac{1}{3}$

Q. 15. $\int_{0}^{\frac{\pi}{12}} \sin 6x \, dx$

$= -\frac{1}{6}[\cos 6x]_0^{\frac{\pi}{12}}$

$= -\frac{1}{6}\left[\cos \frac{\pi}{2} - \cos 0\right]$

$= \frac{1}{6}$

Q. 16. (i) $\int_{0}^{2} \frac{dx}{x^2 + 4}$

$= \frac{1}{2}\left[\tan^{-1} \frac{x}{2}\right]_0^2$

$= \frac{1}{2}[\tan^{-1} 1 - \tan^{-1} 0]$

$= \frac{\pi}{8}$

(ii) $\int_{0}^{\frac{\pi}{2}} \cos^2 x \, dx$

$= \frac{1}{2}\int_{0}^{\frac{\pi}{2}} (1 + \cos 2x) \, dx$

$= \frac{1}{2}\left[x + \frac{\sin 2x}{2}\right]_0^{\frac{\pi}{2}}$

$= \frac{1}{2}\left[\frac{\pi}{2} + \frac{\sin \pi}{2}\right]$

$= \frac{\pi}{4}$