#Important problems on properties of
Definite Integration

Answer

1. $\int_{-\pi}^{\pi}(\cos ax - \sin bx)^2 \, dx$ $\quad\quad \rightarrow 2\pi + \dfrac{\sin 2a\pi}{2a} - \dfrac{\sin 2b\pi}{2b}$

2. $\int_0^{\pi} \dfrac{x}{1+\sin\alpha\sin x}dx$ $\quad\quad \rightarrow \dfrac{\pi}{\cos\alpha}\left(\dfrac{\pi}{2} - \alpha\right)$

3. $\int_0^{\frac{3}{2}} |x\cos\pi| \, dx$ $\quad\quad \rightarrow \dfrac{5\pi-2}{2\pi^2}$

4. $\int_{-\frac{\pi}{2}}^{\frac{\pi}{2}} \dfrac{\cos x}{1+e^x} \, dx$ $\quad\quad \rightarrow 1$

5. $\int_{-2}^{2} \dfrac{x^2}{1+5^x} \, dx$ $\quad\quad \rightarrow \dfrac{8}{3}$

6. $\int_0^1 \dfrac{\log|1+x|}{1+x^2} \, dx$ $\quad\quad \rightarrow \dfrac{\pi}{8}\log 2$

7. $\int_0^{2\pi} \dfrac{1}{1+e^{\sin x}} \, dx$ $\quad\quad \rightarrow \pi$

8. $\int_0^1 \log\left|\dfrac{1}{x} - 1\right| \, dx$ $\quad\quad \rightarrow 0$

9. $\int_0^{\pi} \dfrac{x}{a^2\cos^2 x + b^2\sin^2 x} \, dx$ $\quad\quad \rightarrow \dfrac{\pi^2}{2ab}$

10. $\int_0^{\frac{\pi}{2}} \dfrac{x\sin x\cos x}{\sin^4 x + \cos^4 x} \, dx$ $\quad\quad \rightarrow \dfrac{\pi^2}{16}$

11. $\int_{\frac{\pi}{6}}^{\frac{\pi}{3}} \dfrac{1}{1+\sqrt{\cot x}} \, dx$ $\quad\quad \rightarrow \dfrac{\pi}{12}$

12. $\int_0^{\pi} \dfrac{e^{\cos x}}{e^{\cos x} + e^{-\cos x}} \, dx$ $\quad\quad \rightarrow \dfrac{\pi}{2}$

13. $\int_0^1 \cot^{-1}(1 - x + x^2) \, dx$ $\quad\quad \rightarrow \dfrac{\pi}{2} - \log 2$

14. $\int_{-\frac{1}{2}}^{\frac{1}{2}} \cos x\log\left(\dfrac{1+x}{1-x}\right) \, dx$ $\quad\quad \rightarrow 0$

15. $\int_0^{\pi} \log(1 + \cos x) \, dx$ $\quad\quad \rightarrow -\pi\log 2$