Evaluate the following definite integrals:

1. (*i*) $\int_0^1 \frac{2x}{x^2+1}\,dx$ (*ii*) $\int_1^2 \frac{3x}{9x^2-1}\,dx$

(*iii*) $\int_2^4 \frac{x}{x^2+1}\,dx$ (*iv*) $\int_1^3 (x^2+e^x)(x^3+3e^x+4)\,dx$

(*v*) $\int_0^2 x\sqrt{2+x}\,dx$ (*vi*) $\int_{-1}^2 \frac{x}{(x^2+1)^2}\,dx$

(*vii*) $\int_{-1}^1 5x^4\sqrt{x^5+1}\,dx$ (*viii*) $\int_0^{\pi/4} \sin^3 2t\cos 2t\,dt$

2. (*i*) $\int_1^2 \frac{dx}{x(1+\log x)^2}$ (*ii*) $\int_{\pi/6}^{\pi/2} \frac{\operatorname{cosec} x\cot x}{1+\operatorname{cosec}^2 x}\,dx$

(*iii*) $\int_0^{\pi/6} \cos^{-3} 2\theta \sin 2\theta\,d\theta$ (*iv*) $\int_0^1 \frac{e^x}{1+e^{2x}}\,dx$

(*v*) $\int_0^{\pi/2} \frac{\sin x}{1+\cos^2 x}\,dx$ (*vi*) $\int_0^{\pi/3} \frac{\sec x\tan x}{1+\sec^2 x}\,dx$

(*vii*) $\int_0^2 \frac{6x+3}{x^2+4}\,dx$ (*viii*) $\int_0^1 \frac{2x+3}{5x^2+1}\,dx$

(*ix*) $\int_1^2 \left(\frac{1}{x}-\frac{1}{2x^2}\right)e^{2x}\,dx$ (*x*) $\int_4^9 \frac{\sqrt{x}}{(30-x^{3/2})^2}\,dx$

3. (i) $\int_1^2 \frac{dx}{\sqrt{x^2+4x+3}}$ (ii) $\int_0^{\pi/2} \sqrt{\cos\theta}\,\sin^3\theta\,d\theta$

(iii) $\int_0^1 \frac{\tan^{-1}x}{1+x^2}\,dx$ (iv) $\int_{\pi/4}^{\pi/2} \frac{\cos x\,dx}{(\cos(x/2)+\sin(x/2))^2}$

(v) $\int_0^{(\pi/2)^{1/3}} x^2\sin x^3\,dx$ (vi) $\int_0^1 \sin^{-1}x\,dx$

(vii) $\int_0^2 \frac{1}{x+4-x^2}\,dx$ (viii) $\int_{-1}^1 \frac{1}{x^2+2x+5}\,dx$

4. (i) $\int_0^{\pi/2} \frac{\sin\theta}{\sqrt{1+\cos\theta}}\,d\theta$ (ii) $\int_0^1 \frac{\sqrt{\tan^{-1}x}}{1+x^2}\,dx$

(iii) $\int_0^{\pi/4} \frac{dx}{9+16\cos^2 x}$ (iv) $\int_0^{2\pi} e^{x/2}\sin\left(\frac{\pi}{4}+\frac{x}{2}\right)dx$

(v) $\int_0^4 \frac{dx}{\sqrt{x^2+2x+3}}$ (vi) $\int_0^a \frac{x^4}{\sqrt{a^2-x^2}}\,dx$

5. (i) $\int_0^{\pi} \frac{dx}{5+4\cos x}$ (ii) $\int_0^{\pi/2} \frac{dx}{5+4\sin x}$

(iii) $\int_0^{\pi/2} \frac{dx}{1-2\sin x}$ (iv) $\int_0^{\pi/2} \frac{dx}{3+2\cos x}$

(v) $\int_0^{\pi/2} \frac{dx}{5+3\cos x}$ (vi) $\int_0^{\pi/2} \frac{dx}{2+\cos x}$

6. (i) $\int_0^{\pi/2} \frac{dx}{5+2\cos x}$ (ii) $\int_0^{\pi/2} \frac{dx}{4\cos x+2\sin x}$

(iii) $\int_0^{\pi/2} \frac{dx}{2\cos x+4\sin x}$ (iv) $\int_0^{\pi/4} \frac{dx}{1+\cos^2 x}$

(v) $\int_0^{\pi/4} \frac{dx}{4+9\cos^2 x}$ (vi) $\int_0^{\pi/4} \frac{dx}{a^2\sin^2 x+b^2\cos^2 x}$

7. (i) $\int_0^1 x\sqrt{\frac{1-x^2}{1+x^2}}\,dx$ (ii) $\int_0^{\pi/2} \frac{\cos x}{(2+\sin x)(1+\sin x)}\,dx$

(iii) $\int_0^{\pi/2} x^3\sin 3x\,dx$ (iv) $\int_0^4 \frac{dx}{1+\sqrt{x}}$

(v) $\int_0^1 \sqrt{\frac{1-x}{1+x}}\,dx$ (vi) $\int_0^1 \frac{1-x^2}{(1+x^2)^2}\,dx$

8. (i) $\int_1^2 \frac{dx}{(x+1)\sqrt{x^2-1}}$ (ii) $\int_0^{2\pi} \cos^5 x\,dx$

(iii) $\int_0^1 \sin^{-1}\sqrt{x}\,dx$ (iv) $\int_{-a}^a \sqrt{\frac{a-x}{a+x}}\,dx$

VERY SHORT ANSWER TYPE QUESTIONS

Evaluate the following definite integrals

1. (*i*) $\displaystyle\int_0^{\pi/2} \frac{\sin^3 x\, dx}{\sin^3 x + \cos^3 x}$

(*ii*) $\displaystyle\int_0^{\pi/2} \frac{\cos^5 x\, dx}{\sin^5 x + \cos^5 x}$

(*iii*) $\displaystyle\int_0^{\pi/2} \frac{\sqrt{\sin x}\, dx}{\sqrt{\sin x} + \sqrt{\cos x}}$

(*iv*) $\displaystyle\int_0^{\pi/2} \frac{dx}{1 + \tan^3 x}$

(*v*) $\displaystyle\int_0^{\pi/2} \frac{dx}{1 + \sqrt{\tan x}}$

(*vi*) $\displaystyle\int_0^{\pi/2} \frac{\sin^{3/2} x\, dx}{\sin^{3/2} x + \cos^{3/2} x}$

2. (*i*) $\displaystyle\int_0^{\pi/2} \frac{(\sin x - \cos x)\, dx}{1 + \sin x \cos x}$

(*ii*) $\displaystyle\int_{\pi/6}^{\pi/3} \frac{\sqrt{\sin x}}{\sqrt{\sin x} + \sqrt{\cos x}}\, dx$