Integration Techniques Self-Practice Questions

1. (i) $\int \cos^2 x \ \mathrm{d}x$ (ii) $\int \sin^2 x \ \mathrm{d}x$

2. (i) $\int \sec^2 x \ \mathrm{d}x$ (ii) $\int \tan^2 x \ \mathrm{d}x$

3. (i) $\int \sec x \ \mathrm{d}x$ (ii) $\int \tan x \ \mathrm{d}x$ (iii) $\int \sec x \tan x \ \mathrm{d}x$

4. (i) $\int \sin^2 x \cos x \ \mathrm{d}x$ (ii) $\int \tan^3 x \sec^2 x \ \mathrm{d}x$

5. $\int \sin 4x \cos 3x \ \mathrm{d}x$

6. (i) $\int \dfrac{x^2}{x^2 - 1} \ \mathrm{d}x$ (ii) $\int \dfrac{1}{(x-1)(x^2+1)} \ \mathrm{d}x$

7. (i) $\int \dfrac{1}{\sqrt{4 - 9x^2}} \ \mathrm{d}x$ (ii) $\int \dfrac{1}{\sqrt{8 - 2x - x^2}} \ \mathrm{d}x$

8. (i) $\int \dfrac{1}{4 + 9x^2} \ \mathrm{d}x$ (ii) $\int \dfrac{1}{8 - 2x - x^2} \ \mathrm{d}x$

9. (i) $\int \dfrac{e^{\sqrt{x}}}{\sqrt{x}} \ \mathrm{d}x$ (ii) $\int \dfrac{x}{\sqrt{1 - x^2}} \ \mathrm{d}x$

10. (i) $\int \dfrac{x+3}{\sqrt{4 - x^2}} \ \mathrm{d}x$ (ii) $\int \dfrac{x}{x^2 - 2x + 3} \ \mathrm{d}x$

11. (i) $\int (\ln x)^2 \ \mathrm{d}x$ (ii) $\int e^x \sin x \ \mathrm{d}x$ (iii) $\int \sin^{-1} 2x \ \mathrm{d}x$

12. $\int x^3 e^{x^2} \ \mathrm{d}x$

13. $\int a^x \ \mathrm{d}x$

Detailed solutions at

Answers:

1.   (i) $\dfrac{1}{2}x+\dfrac{1}{4}\sin 2x+C$ (ii) $\dfrac{1}{2}x-\dfrac{1}{4}\sin 2x+C$

2.   (i) $\tan x+C$ (ii) $\tan x-x+C$

3.   (i) $\ln|\sec x+\tan x|+C$ (MF26)   (ii) $\ln|\sec x|+C$ (MF26)   (iii) $\sec x+C$

4.   (i) $\dfrac{1}{3}\sin^3 x+C$ (ii) $\dfrac{1}{4}\tan^4 x+C$

5. $-\dfrac{1}{14}\left(\cos 7\theta+7\cos\theta\right)+C$ (Use Factor Product formula from MF26)

6.   (i) $x+\dfrac{1}{2}\ln\left|\dfrac{x-1}{x+1}\right|+C$ (ii) $\dfrac{1}{2}\ln|x-1|-\dfrac{1}{4}\ln\left(x^2+1\right)-\dfrac{1}{2}\tan^{-1}x+C$

7.   (i) $\dfrac{1}{3}\sin^{-1}\left(\dfrac{3x}{2}\right)+C$ (ii) $\sin^{-1}\left(\dfrac{x+1}{3}\right)+C$

8.   (i) $\dfrac{1}{6}\tan^{-1}\left(\dfrac{3x}{2}\right)+C$ (ii) $\dfrac{1}{6}\ln\left|\dfrac{4+x}{2-x}\right|+C$

9   (i) $2e^{\sqrt{x}}+c$ (ii) $-\sqrt{1-x^2}+C$

10   (i) $-\sqrt{4-x^2}+3\sin^{-1}\left(\dfrac{x}{2}\right)+C$ (ii)$\dfrac{1}{2}\ln|x^2-2x+3|+\dfrac{1}{\sqrt{2}}\tan^{-1}\left(\dfrac{x-1}{\sqrt{2}}\right)+C$

11   (i) $x(\ln x)^2-2x\ln x+2x+C$ (ii) $\dfrac{1}{2}e^x\left(\sin x-\cos x\right)+C$

     (iii) $x\sin^{-1}2x+\dfrac{1}{2}\sqrt{1-4x^2}+c$

12. $\dfrac{1}{2}xe^{x^2}-\dfrac{1}{2}e^{x^2}+C$

13. $\dfrac{a^x}{\ln a}$