1. $\int \frac{1-x^7}{x(1+x^7)}dx$ equals -

(A) $\ln x + \frac{2}{7}\ln(1+x^7)+c$ (B) $\ln x - \frac{2}{7}\ln(1-x^7)+c$

(C) $\ln x - \frac{2}{7}\ln(1+x^7)+c$ (D) $\ln x + \frac{2}{7}\ln(1-x^7)+c$

2. Primitive of $\frac{3x^4-1}{(x^4+x+1)^2}$ w.r.t. x is -

(A) $\frac{x}{x^4+x+1}+c$ (B) $-\frac{x}{x^4+x+1}+c$ (C) $\frac{x+1}{x^4+x+1}+c$ (D) $-\frac{x+1}{x^4+x+1}+c$

3. If $\int \frac{\cos x-\sin x+1-x}{e^x+\sin x+x}dx = \ln(f(x)) + g(x) + C$ where C is the constant of integration and $f(x)$ is positive, then $f(x) + g(x)$ has the value equal to

(A) $e^x + \sin x + 2x$ (B) $e^x + \sin x$ (C) $e^x - \sin x$ (D) $e^x + \sin x + x$

4. Integral of $\sqrt{1+2\cot x(\cot x+\operatorname{cosec} x)}$ w.r.t. x is

(A) $2\ln\cos\frac{x}{2}+c$ (B) $2\ln\sin\frac{x}{2}+c$

(C) $\frac{1}{2}\ln\cos\frac{x}{2}+c$ (D) $\ln\sin x - \ln(\operatorname{cosec} x - \cot x)+c$

5. $\int x\cdot\frac{\ln\left(x+\sqrt{1+x^2}\right)}{\sqrt{1+x^2}}dx$ equals -

(A) $\sqrt{1+x^2}\ln\left(x+\sqrt{1+x^2}\right)-x+c$ (B) $\frac{x}{2}\cdot\ln^2\left(x+\sqrt{1+x^2}\right)-\frac{x}{\sqrt{1+x^2}}+c$

(C) $\frac{x}{2}\cdot\ln^2\left(x+\sqrt{1+x^2}\right)+\frac{x}{\sqrt{1+x^2}}+c$ (D) $\sqrt{1+x^2}\ln\left(x+\sqrt{1+x^2}\right)+x+c$

6. Let $g(x)$ be an antiderivative for $f(x)$. Then $\ln\left(1+(g(x))^2\right)$ is an antiderivative for

(A) $\frac{2f(x)g(x)}{1+(f(x))^2}$ (B) $\frac{2f(x)g(x)}{1+(g(x))^2}$ (C) $\frac{2f(x)}{1+(f(x))^2}$ (D) none

7. A function $y = f(x)$ satisfies $f''(x) = -\frac{1}{x^2} - \pi^2\sin(\pi x)$; $f'(2) = \pi+\frac{1}{2}$ and $f(1) = 0$. The value of $f\left(\frac{1}{2}\right)$ is

(A) $\ln 2$ (B) 1 (C) $\frac{\pi}{2}-\ln 2$ (D) $1-\ln 2$

8. Consider $f(x)=\frac{x^2}{1+x^3}$; $g(t)=\int f(t)dt$. If $g(1)=0$ then $g(x)$ equals-

(A) $\frac{1}{3}\ell n(1+x^3)$ (B) $\frac{1}{3}\ell n\left(\frac{1+x^3}{2}\right)$ (C) $\frac{1}{2}\ell n\left(\frac{1+x^3}{3}\right)$ (D) $\frac{1}{3}\ell n\left(\frac{1+x^3}{3}\right)$

9. $\int\frac{e^{\sqrt{x}}}{\sqrt{x}}\left(x+\sqrt{x}\right)dx$

(A) $2e^{\sqrt{x}}\left[x-\sqrt{x}+1\right]+C$ (B) $e^{\sqrt{x}}\left[x-2\sqrt{x}+1\right]$

(C) $e^{\sqrt{x}}\left(x+\sqrt{x}\right)+C$ (D) $e^{\sqrt{x}}\left(x+\sqrt{x}+1\right)+C$

10. $\int\frac{dx}{\sqrt[3]{x^{5/2}(x+1)^{7/2}}}$

(A) $-\left(\frac{x+1}{x}\right)^{1/6}+C$ (B) $6\left(\frac{x+1}{x}\right)^{-1/6}+C$ (C) $\left(\frac{x}{x+1}\right)^{5/6}+C$ (D) $-\left(\frac{x}{x+1}\right)^{5/6}+C$

11. Let $f(x)=\frac{2\sin^2 x-1}{\cos x}+\frac{\cos x(2\sin x+1)}{1+\sin x}$ then $\int e^x(f(x)+f'(x))dx$ where c is the constant of integration)

(A) $e^x\tan x+c$ (B) $e^x\cot x+c$ (C) $e^x\operatorname{cosec}^2x+c$ (D) $e^x\sec^2x+c$

12. $\int\frac{x^2(1-\ell n x)}{\ell n^4 x-x^4}dx$ equals

(A) $\frac{1}{2}\ell n\left(\frac{x}{\ell n x}\right)-\frac{1}{4}\ell n\left(\ell n^2x-x^2\right)+C$ (B) $\frac{1}{4}\ell n\left(\frac{\ell n x-x}{\ell n x+x}\right)-\frac{1}{2}\tan^{-1}\left(\frac{\ell n x}{x}\right)+C$

(C) $\frac{1}{4}\ell n\left(\frac{\ell n x+x}{\ell n x-x}\right)+\frac{1}{2}\tan^{-1}\left(\frac{\ell n x}{x}\right)+C$ (D) $\frac{1}{4}\left(\ell n\left(\frac{\ell n x-x}{\ell n x+x}\right)+\tan^{-1}\left(\frac{\ell n x}{x}\right)\right)+C$

13. If $\int\frac{(2x+3)dx}{x(x+1)(x+2)(x+3)+1}=C-\frac{1}{f(x)}$, where $f(x)$ is of the form of ax^2+bx+c then $(a+b+c)$ equals

(A) 4 (B) 5 (C) 6 (D) none

14. $\int e^x\left(\frac{x^2-3}{(x-1)^2}\right)dx$ is equal to -

(A) $e^x\frac{(x+3)}{(x-1)}+C$ (B) $e^x\left(\frac{x-3}{x-1}\right)+C$ (C) $e^x\left(\frac{x+1}{x-1}\right)+C$ (D) $e^x\left(\frac{1}{x-1}\right)^2+C$

(where C is constant of integration)