1. The indefinite integral $\int \frac{dx}{\left(x^2+4x+5\right)^2}$ equals:

(1) $\frac{1}{2}\tan^{-1}(x+2)+\frac{x+2}{2\left(x^2+4x+5\right)}+c$
(2) $\tan^{-1}(x+2)+\frac{x+2}{x^2+4x+5}+c$
(3) $\tan^{-1}(x+2)-\left(\frac{x+2}{x^2+4x+5}\right)+c$
(4) $\frac{1}{2}\tan^{-1}(x+2)-\left(\frac{x+2}{2\left(x^2+4x+5\right)}\right)+c$

2. $\int \frac{\mathrm{dx}}{\sec \mathrm{x}+\operatorname{cosec} \mathrm{x}}$

(1) $\frac{1}{2}(-\cos \mathrm{x}+\sin \mathrm{x})-\frac{1}{2\sqrt{2}}\log \tan\left(\frac{\mathrm{x}}{2}+\frac{\pi}{8}\right)+\mathrm{c}$
(2) $\frac{1}{2}(-\cos \mathrm{x}+\sin \mathrm{x})+\frac{1}{\sqrt{2}}\log \tan\left(\frac{\mathrm{x}}{2}+\frac{\pi}{8}\right)+\mathrm{C}$
(3) $\frac{1}{2}(\cos \mathrm{x}+\sin \mathrm{x})-\frac{1}{\sqrt{2}}\log\left(\frac{\mathrm{x}}{2}-\frac{\pi}{8}\right)+\mathrm{C}$
(4) $\frac{1}{2}(-\cos x+\sin x)+\frac{1}{2\sqrt{2}}\log\left|\tan\left(\frac{x}{2}-\frac{\pi}{8}\right)\right|+c$

3. $\int \frac{dx}{\left(x+\sqrt{x(1+x)}\right)^2}$

(1) $-2\ln\left(1+\sqrt{1+\frac{1}{x}}\right)-\frac{2}{1+\sqrt{1+\frac{1}{x}}}+c$
(2) $-2\ln\left(1-\sqrt{1+\frac{1}{x}}\right)+\frac{2}{1+\sqrt{1+\frac{1}{x}}}+c$
(3) $-2\ln\left(1+\sqrt{1-\frac{1}{x}}\right)+\frac{2}{1+\sqrt{1-\frac{1}{x}}}+c$
(4) $-2\ln\left(1-\sqrt{1+\frac{1}{x}}\right)+\frac{2}{1-\sqrt{1+\frac{1}{x}}}+c$

4. If $\int \frac{\sqrt{1-x^2}}{x^4}dx=A(\mathrm{x})\left(\sqrt{1-x^2}\right)^m+C$, for a suitable chosen integer m and a function A(x), where C is a constant of integration, then $(\mathrm{A(x)})^{\mathrm{m}}$ equals :

(1) $\frac{-1}{27x^9}$
(2) $\frac{-1}{3x^3}$
(3) $\frac{1}{27x^6}$
(4) $\frac{1}{9x^4}$

5. If $\int \frac{1}{a^2\sin^2 x+b^2\cos^2 x}dx=\frac{1}{12}\tan^{-1}(3\tan x)+C$, then the maximum value of $a\sin x+b\cos x$ is

(1) $\sqrt{41}$
(2) $\sqrt{40}$
(3) $\sqrt{39}$
(4) $\sqrt{38}$

6. $\int \frac{1}{7+5\cos x}dx$ is equal to

(1) $\frac{1}{\sqrt{6}}\tan^{-1}\left(\frac{1}{\sqrt{6}}\tan\frac{x}{2}\right)+C$
(2) $\frac{1}{\sqrt{3}}\tan^{-1}\left(\frac{1}{\sqrt{3}}\tan\frac{x}{2}\right)+C$
(3) $\frac{1}{4}\tan^{-1}\left(\frac{x}{2}\right)+C$
(4) $\frac{1}{7}\tan^{-1}\left(\tan\frac{x}{2}\right)+C$

7. $\int \frac{1-\cos x-x\sin x}{x^2+1-2x\sin x}dx=\tan^{-1}\left(f\left(x\right)\right)+c$, then $f(n)$ is

(1) continuous at $x=0$
(2) an odd function
(3) an even function
(4) $f\left(\frac{\pi}{2}\right)=1$

8. The integral $\int \frac{dx}{(x+4)^{\frac{8}{7}}(x-3)^{\frac{6}{7}}}$ is equal to: (where C is a constant of integration)

(1) $\left(\frac{x-3}{x+4}\right)^{\frac{1}{7}}+C$
(2) $\left(\frac{x-3}{x+4}\right)^{\frac{-1}{7}}+C$
(3) $\frac{1}{2}\left(\frac{x-3}{x+4}\right)^{\frac{3}{7}}+C$
(4) $-\frac{1}{13}\left(\frac{x-3}{x+4}\right)^{\frac{-13}{7}}+C$

9. Find the ordered triplet $(A,\ B,\ \lambda)$, If $\int \frac{2\cos x-\sin x+\lambda}{\cos x+\sin x-2}dx=A\log_e(|\cos x+\sin x-2|)+Bx+C$.

(1) $\left(\frac{1}{2},\frac{3}{2},-1\right)$
(2) $\left(\frac{3}{2},\frac{1}{2},-1\right)$
(3) $\left(\frac{1}{2},-1,-\frac{3}{2}\right)$
(4) $\left(\frac{3}{2},-1,-\frac{1}{2}\right)$

10. Let $f(x)$ be a polynomial of degree three satisfying $f(0)=-1$ and $f(1)=0$. Also, 0 is a stationary point of $f(x)$, does not have an extrema at $x=0$, then the value of the integral $\int \frac{\mathrm{f}(\mathrm{x})}{\mathrm{x}^3-1}\mathrm{dx}$, is

(1) $\frac{\mathrm{x}^2}{2}+\mathrm{c}$
(2) $\mathrm{x}+\mathrm{c}$
(3) $\frac{\mathrm{x}^3}{\mathrm{b}}+\mathrm{c}$
(4) None of these