Integral Calculus - 1

Date Planned : __ / __ / __	Daily Tutorial Sheet - 12	Expected Duration : 90 Min
Actual Date of Attempt : __/__/__	Numerical Value Type for JEE Main	Exact Duration :________

141. If $\int\left[\left(\frac{x}{e}\right)^x+\left(\frac{e}{x}\right)^x\right]\ln x\,dx=A\left(\frac{x}{e}\right)^x+B\left(\frac{e}{x}\right)^x$ then value of $A+B$ is

142. If $\int\frac{\left(2x^2+1\right)dx}{\left(x^2-4\right)\left(x^2-1\right)}=\log\left[\left(\frac{x+1}{x-1}\right)^a\left(\frac{x-2}{x+2}\right)^b\right]+C$ then $a+b$ equals

143. If $I=\int\sec^2 x\ \text{cosec}^4 x\ dx\ =A\cos^2 x-\cot^3 x+B\tan x+C\cot x+D$ Then $3\left(A-C+B\right)$ equals

144. If $I=\int\frac{\sin x+\sin^3 x}{\cos 2x}\ dx\ =P\cos x+Q\log\left|\ f\left(x\right)\right|+R$ Then $P-\sqrt{2}Q$ equals

145. If the primitive of $f(x)=\pi\sin\pi x+2x-4$ has the value 3 for x = 1, then there are exactly k values of x for which primitive of $f(x)$ vanishes then the value of k is?

146. Let $f(x)$ be a cubic polynomial with leading coefficient unity such that $f(0)=1$ and all the roots of $f'(x)=0$ are also roots of $f(x)=0$. If $\int f(x)dx=g(x)+C$, where $g(0)=\frac{1}{4}$ and C is constant of integration, then $g(3)-g(1)$ is equal to:

147. Let $f:\left[0,\frac{\pi}{2}\right]\to R$ be continuous and satisfy $f'(x)=\frac{1}{1+\cos x}$ for all $x\in\left(0,\frac{\pi}{2}\right)$. If $f(0)=3$ then $f\left(\frac{\pi}{2}\right)$ has the value equal to:

148. Let $\int\frac{dx}{x^{2008}+x}=\frac{1}{p}\ln\left(\frac{x^q}{1+x^r}\right)+C$, where $p,q,r\in N$ and need not be distinct, then the value of $p+q+r-6000$ equals:

149. $\int P(x).e^{kx}dx=Q(x)e^{4x}+C$, where $P(x)$ is polynomial of degree n and $Q(x)$ is: polynomial of degree 7. Then the value of $n+7+k+\lim\limits_{x\to\infty}\frac{P(x)}{Q(x)}$ is:

150. If $\int\frac{dx}{x+x^{2011}}=f(x)+C_1$ and $\int\frac{x^{2009}}{1+x^{2010}}dx=g(x)+C_2$ (where C_1 and C_2 are constants of integration). Let $h(x)=f(x)+g(x)$. If $h(1)=0$ then $h(e)$ is equal to:

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

152. If $\int (x^{2010}+x^{804}+x^{402})(2x^{1608}+5x^{402}+10)^{\frac{1}{402}}dx = \frac{1}{10a}(2x^{2010}+5x^{804}+10x^{402})^{\frac{a}{402}}$, then find the value of $\frac{a}{10}$.

153. Suppose $\int \frac{1-7\cos^2 x}{\sin^7 x\cos^2 x}dx = \frac{g(x)}{\sin^7 x}+C$, where C is an arbitrary constant of integration. Then find the value of $g'(0)+g''\left(\frac{\pi}{4}\right)$.

154. Let $\int \frac{(1+x^4)dx}{(1-x^4)^{\frac{3}{2}}} = f(x)+C_1$ where $f(0)=0$ and $\int f(x)dx = g(x)+C_2$ with $g(0)=0$. If $g\left(\frac{1}{\sqrt{2}}\right)=\frac{\pi}{k}$. Find k.

155. Let $\int \sec^{-1}\left[-\sin^2 x\right]dx = f(x)+C$ where [y] denotes largest integer $\leq$ y, then find the value of $\left[f\left(\frac{8}{\pi x}\right)\right]''$ at $x=2$.