18.Definite Integrals and Applications of Integrals

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Section-A JEE Advanced/IIT-JEE

C. MCQs with One Correct Answer

21) If lm,n=$\int_0^1 t^m 1+t^n$dt, then the expression for l m,n in terms of $lm+1,n-1$is (2003S)
   a) $\frac{2^n}{m+1}$-$\frac{n}{m+1}lm+1,n-1$
   b) $\frac{n}{m+1}lm+1,n-1$
   c) $\frac{2^n}{m+1}$+$\frac{n}{m+1}lm+1,n-1$
   d) $\frac{m}{n+1}lm+1,n-1$
22) If fx= $\int_{x^2}^{x^2+1} e^{-t^2}$dt ,then fxincreases in (2003S)
   a) $-2,2$
   b) no value of x
   c) $0,\infty$
   d) $-\infty,0$
23) The area bounded by the curves y= $\sqrt{x}$,2y+3=x and x-axis in the 1^{st}quadrant is (2003S)
   a) 9
   b) $\frac{27}{4}$
   c) 36
   d) 18
24) If fxis differentiable and$\int_0^{t^2} xfxdx = \frac{2}{5}t^5$, then $f\frac{4}{25}$ equals (2004S)
   a) $\frac{2}{5}$
   b) $\frac{-5}{2}$
   c) 1
   d) $\frac{5}{2}$
25) The value of the integral$\int_0^1 \sqrt{\frac{1-x}{1+x}}dx$ is (2004S)
   a) $\frac{\pi}{2}+1$
   b) $\frac{\pi}{2}-1$
   c) -1
   d) 1
26) The area enclosed between the curves y=$ax^2$and$x = ay^2$a>0is $1sq.unit$,then the value of a is (2004S)
   a) $\frac{1}{\sqrt{3}}$
   b) $\frac{1}{2}$
   c) 1
   d) $\frac{1}{3}$
27) $\int_{-2}^{0} x^3+3x^2+3x+3+x+1cosx+1$dx is equal to (2005S)
   a) -4
   b) 0
   c) 4
   d) 6
28) The area bounded by the parabolas $y = x+1^2$and$y = x-1^2$and the line$y = \frac{1}{4}$is (2005S)
   a) $4sq.units$
   b) $\frac{1}{6}sq.units$
   c) $\frac{4}{3}$sq.units
   d) $\frac{1}{3}$sq.units
29) The area of the region between the curves $y = \sqrt{\frac{1+sinx}{cosx}}$andy = $\sqrt{\frac{1-sinx}{cosx}}$bounded by the lines $x =$ 0and$x = \frac{\pi}{4}$is (2008)
   a) $\int_0^{\sqrt{2}-1} \frac{t}{1+t^2\sqrt{1-t^2}}dt$
   b) $\int_0^{\sqrt{2}-1} \frac{4t}{1+t^2\sqrt{1-t^2}}$dt
   c) $\int_0^{\sqrt{2}+1} \frac{4t}{1+t^2\sqrt{1-t^2}}dt$
   d) $\int_0^{\sqrt{2}+1} \frac{t}{1+t^2\sqrt{1-t^2}}dt$
30) Let $f$be a non-negative function defined on the interval $0,1$·If$\int_0^x \sqrt{1-f'{t}^2} = \int_0^x ftdt$,$0 \le x \le 1$,and$f0 = 0$,then (2009)
   a) $f\frac{1}{2}<\frac{1}{2}$and$f\frac{1}{3}>\frac{1}{3}$
   b) $f\frac{1}{2}>\frac{1}{2}and f\frac{1}{3}>\frac{1}{3}$
   c) $f\frac{1}{2}<\frac{1}{2}and f\frac{1}{3}<\frac{1}{3}$
   d) $f\frac{1}{2}>\frac{1}{2}and f\frac{1}{3}<\frac{1}{3}$
31) The value of $\lim_{x\to 0}\frac{1}{x^3}\int_0^x \frac{t\ln 1+t}{t^4+4}dt$ is (2010)
   a) 0
   b) $\frac{1}{12}$
   c) $\frac{1}{24}$
   d) $\frac{1}{64}$
32) Let f be a real valued function defined on the interval -1,1 such that $e^{-x}fx = 2$+$\int_0^x \sqrt{t^4+1}dt$, for all $x \in -1,1$,and let f^{-1}be the inverse function f.Then ${f^{-1}}'(2)$is equal to (2010)
   a) 1
   b) $\frac{1}{3}$

c) $\frac{1}{2}$
d) $\frac{1}{e}$

33) The value of $\int_{\sqrt{\ln 2}}^{\sqrt{\ln 3}} \frac{x sin x^2}{sin x^2 + sin \ln 6 - x^2} dx$ is (2011)
a) $\frac{1}{4} \ln \frac{3}{2}$
b) $\frac{1}{2} \ln \frac{3}{2}$
c) $\ln \frac{3}{2}$
d) $\frac{1}{6} \ln \frac{3}{2}$

34) Let the straight line$x = b$ divide the area enclosed by $y = 1 - x^2$,$y = 0$,and$x = 0$into two parts $R_1 0 \leq x \leq b$ and $R_2 b \leq x \leq 1$ such that $R_1 - R_2 = \frac{1}{4}$·Then b equals (2011)
a) $\frac{3}{4}$
b) $\frac{1}{2}$
c) $\frac{1}{3}$
d) $\frac{1}{4}$

35) Let $f : -1, 2 \rightarrow [0, \infty)$ be a continuous function such that $f x = f 1 - x$for all $x \in -1, 2$.Let $R_1 = \int_{-1}^{2} x f x dx$, and R_2be the area of the region bounded by $y = f x$,$x = -1$,$x = 2$,and the x-axis ·
Then (2011)
a) $R_1 = 2R_2$
b) $R_1 = 3R_2$
c) $2R_1 = R_2$
d) $3R_1 = R_2$