University of Mumbai

Program: _First Year (All Branches) Engineering- SEM-II
Curriculum Scheme: Rev 2019
Engineering Mathematics-II

Question Bank

==

MCQ

1.	The value of $\beta\left(\frac{5}{2},\frac{3}{2}\right)$ is equal to
Option A:	$\sqrt{\pi}$
Option B:	$\sqrt{2\pi}$
Option C:	π
Option D:	$\pi/16$
2.	Length of the curve $y = logcosx$ from $x = 0\ to\ x = \frac{\pi}{3}$ is
Option A:	$\log(1+\sqrt{2})$
Option B:	$\log(2+\sqrt{3})$
Option C:	$\log\ 2$
Option D:	$\log\ 5$
3.	Integrating factor of $(12y + 4y^3 + 6x^2)dx + 3(x + xy^2)dy = 0$ is
Option A:	x^3
Option B:	x^2
Option C:	$logx$
Option D:	e^x
4.	The solution of differential equation $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = 0$ is
Option A:	$(c_1 + c_2x)c_3xe^{-x}$
Option B:	$(c_1 + c_2x)e^{-2x}$
Option C:	$(c_1 + c_2x)e^{2x}$
Option D:	$(c_1 + c_2x)c_3xe^{x}$
5.	Particular Integral (P.I.) of differential equation $(D^3 - 3D^2)y = e^{4x}$ is
Option A:	$P.I. = \frac{1}{16}e^{-4x}$
Option B:	$P.I. = \frac{1}{64}e^{-4x}$
Option C:	$P.I. = \frac{1}{16}e^{4x}$
Option D:	$P.I. = \frac{1}{64}e^{4x}$
6.	Value of the integral $\int_0^\infty \int_0^\infty \int_0^\infty e^{-(x+y+z)}dx\,dy\,dz$ is
Option A:	∞
Option B:	0
Option C:	1
Option D:	-1

7.	Solution of the triple integral $\int_0^{\pi/2}\int_0^{\pi/2}\int_0^1 r^4\, sin\theta\, dr\, d\theta\, d\varphi$ is
Option A:	$\pi/10$
Option B:	$\pi/6$
Option C:	1
Option D:	π
8.	Integral $\int_0^{\infty}\int_0^{\infty}\frac{dxdy}{(1+x^2)(1+y^2)}$ is equal to
Option A:	$\frac{\pi}{8}$
Option B:	$\frac{\pi}{2}$
Option C:	$\frac{\pi^2}{4}$
Option D:	$\frac{\pi^2}{8}$
9.	The value of $\int_0^1\int_0^{\pi/2} r\, sin\theta\, dr\, d\theta$ is
Option A:	½
Option B:	$\pi/2$
Option C:	$1/8$
Option D:	$\pi/8$
10.	Changing to polar co-ordinates the integral $\int_0^a\int_0^{\sqrt{a^2-x^2}} y^2\sqrt{x^2+y^2}\, dydx$ will be
Option A:	$\int_0^{\pi/2}\int_0^a sin^2\theta\, r^4 drd\theta$
Option B:	$\int_0^{\pi/2}\int_0^a sin^4\theta\, r^3 drd\theta$
Option C:	$\int_0^{2\pi}\int_0^{a/2} sin^2\theta\, r^4 drd\theta$
Option D:	$\int_0^a\int_0^a sin^2\theta\, r^4 drd\theta$
11.	The Integrating Factor of DE $(x^2\, e^x - my)dx + mx\, dy = 0$ is given by
Option A:	$\frac{1}{y^2}$
Option B:	$\frac{1}{x^2}$
Option C:	$-\frac{1}{y^2}$
Option D:	$-\frac{1}{x^2}$
12.	The DE $\frac{dr}{d\theta} = r\tan\theta - \frac{r^2}{\cos\theta}$ can be reduced to linear equation given by
Option A:	$\frac{dv}{d\theta} + \tan\theta\, v = \sec\theta$
Option B:	$\frac{dv}{d\theta} + \sec\theta\, v = -\tan\theta$

Option C:	$\frac{dv}{d\theta}+\tan\theta\, v=-\sec\theta$
Option D:	$\frac{dv}{d\theta}+\sec\theta\, v=\tan\theta$
13.	The solution of $(D^3-2D+4)\,y=0$,where $D\equiv\frac{d}{dx}$ is given by
Option A:	$y=c_1e^{-2x}+c_2\cos x+c_3\sin x$
-Option B:	$y=c_1x\,e^{-2x}+c_2\cos x+c_3\sin x$
Option C:	$y=c_1+c_2\cos x+c_3\sin x$
Option D:	$y=c_1e^{-2x}+e^{x}(c_2\cos x+c_3\sin x)$
14.	The Particular Integral (P I) of the equation $(D^2-1)y=x\,e^x$ where $D\equiv\frac{d}{dx}$ is given by
Option A:	$\text{P I}=\frac{e^x}{4}(x^2-x)$
Option B:	$\text{P I}=\frac{e^x}{4}(2x-1)$
Option C:	$\text{P I}=\frac{e^x}{4}(x^2+x)$
Option D:	$\text{P I}=\frac{e^x}{4}(2x+1)$
15.	The Value of $\int_0^\infty e^{-x^4}\,dx$ is given by
Option A:	$\Gamma\left(\frac{1}{4}\right)$
Option B:	$\frac{1}{4}\,\Gamma\left(\frac{3}{4}\right)$
Option C:	$\frac{1}{4}\,\Gamma\left(\frac{1}{4}\right)$
Option D:	$\Gamma\left(\frac{3}{4}\right)$
16.	The length of the straight line $y=2x+5$ $from$ $x=1$ to $x=3$ is given by
Option A:	$\sqrt{5}$ units
Option B:	$3\sqrt{5}$ units
Option C:	$4\sqrt{5}$ units
Option D:	$2\sqrt{5}$ units
17.	After changing the integral $I=\int_0^1\int_0^{\sqrt{1-x^2}}x^2y^2\,dy\,dx$ into polar form, the integral can be given by
Option A:	$I=\int_0^{\pi/2}\int_{r=0}^{1} r^4\cos^2\theta\,\sin^2\theta\,dr\,d\theta$

Option B:	$I = \int_0^{\pi/2} \int_{r=0}^{1} r^5 cos^2\theta \, sin^2\theta \, dr \, d\theta$
Option C:	$I = \int_0^{\pi} \int_{r=0}^{1} r^4 cos^2\theta \, sin^2\theta \, dr \, d\theta$
Option D:	$I = \int_0^{\pi} \int_{r=0}^{1} r^5 cos^2\theta \, sin^2\theta \, dr \, d\theta$
18.	The value of $I = \int_0^1 \int_0^1 \int_0^1 x\, y\, z\, dx\, dy\, dz$ is given by
Option A:	$-\frac{1}{8}$
Option B:	$\frac{1}{4}$
Option C:	$-\frac{1}{4}$
Option D:	$\frac{1}{8}$
19.	The value of $I = \int_0^1 \left(1 - \sqrt[5]{x}\right) dx$ will be given by
Option A:	$-\frac{1}{6}$
Option B:	$\frac{1}{6}$
Option C:	$\frac{1}{30}$
Option D:	$-\frac{1}{30}$
20.	The value of $I = \int_0^{\pi} \int_{r=0}^{a\sin\theta} dr\, d\theta$ is given by
Option A:	a
Option B:	$-a$
Option C:	$2a$
Option D:	$-2a$
21.	$\int_0^1 \frac{1}{\sqrt{-logx}}$ dx is
Option A:	π
Option B:	$\sqrt{\pi}/2$
Option C:	$\sqrt{\pi}$
Option D:	$2\sqrt{\pi}$
22.	Find the complementary function of $\frac{d^4y}{dx^4} + 6\frac{d^2y}{dx^2} + 9y = e^{2x}$

Option A:	$(c_1 + c_2x)cos\sqrt{3}x + (c_3 + c_4x)sin\sqrt{3}x$
Option B:	$c_1cos\sqrt{3}x + c_2sin\sqrt{3}x$
Option C:	$c_1e^{\sqrt{3}x} + c_2e^{-\sqrt{3}x}$
Option D:	$(c_1 + c_2x)e^{\sqrt{3}x}$
23.	$The\ value\ of\ \int_0^1\int_0^2\int_0^2 x^3yz\ dxdydz\ is$
Option A:	1
Option B:	$1/3$
Option C:	2
Option D:	$2/3$
24.	The Order of the Differential Equation $\left(\frac{d^2y}{dx^2}\right)^3 + \left(\frac{dy}{dx}\right)^2 + y^4 = e^{-x}\ is$
Option A:	1
Option B:	2
Option C:	3
Option D:	4
25.	$The\ value\ of\ \int_0^{\pi/2}\int_0^{acos\theta} rsin\theta\ drd\theta$ is equal to
Option A:	$a^2/9$
Option B:	$a^2/12$
Option C:	$a^2/6$
Option D:	$a^2/3$
26.	The value of $\Gamma\left(\frac{1}{4}\right)\Gamma(-\frac{1}{4})$
Option A:	$4\sqrt{2}\pi$
Option B:	$-4\sqrt{2}\pi$
Option C:	$\sqrt{2}\pi$
Option D:	$-\sqrt{2}\pi$
27.	Integrating factor of $(x^2 + y^2 + 1)dx - 2xy\ dy = 0\ is$
Option A:	$\frac{-1}{x^2}$
Option B:	$\frac{1}{x^2}$
Option C:	x^2
Option D:	$-x^2$
29.	Particular Integral of DE $(D^3 + 3D^2 - 4)y = e^x$ is
Option A:	$xe^x/9$
Option B:	$xe^x/2$
Option C:	$-xe^x/9$
Option D:	$xe^x/6$
30.	The value of $\int_0^{\pi}\frac{sin^4\theta}{(1+cos\theta)^2}d\theta$
Option A:	6π
Option B:	$3\pi/4$
Option C:	$\pi/2$
Option D:	$3\pi/2$

31.	The area bounded by the line $y = x$ and $y = 4x - x^2$
Option A:	7/2
Option B:	9/2
Option C:	9/4
Option D:	11
32.	The solution of DE $(D^3 - D)y = cosx$ is
Option A:	$(c_1 + c_2 x + c_3 x^2)e^x + (-\frac{1}{2})sinx$
Option B:	$(c_1 + c_2 e^x + c_2 e^{-x} + (-\frac{1}{2})cosx$
Option C:	$(c_1 + c_2 e^x + c_2 e^{-x} + (\frac{-1}{2})sinx$
Option D:	$(c_1 + c_2 x + c_3 x^2)e^x + (-\frac{1}{2})cosx$
34.	The value of $\iint dxdy$ over the area bounded by $x^2 = y$ and $y^2 = -x$
Option A:	-1/6
Option B:	-1/12
Option C:	1/18
Option D:	1/9
35.	The value of integral $\iiint \frac{dxdydz}{x^2+y^2+z^2}$ over the positive octant of the sphere $x^2 + y^2 + z^2 = 4$ is
Option A:	π
Option B:	2π
Option C:	$4\pi/3$
Option D:	$2\pi/3$
36.	The length of the cardioid $r = 2(1 + cos\theta)$ is
Option A:	16
Option B:	12
Option C:	8
Option D:	6
37.	The value of $\int_0^2 \int_0^{\sqrt{4-x^2}} xy\, dxdy$ is equal to
Option A:	4
Option B:	6
Option C:	2
Option D:	3
38.	The Solution of $\frac{dy}{dx} = \frac{y+1}{(y+2)e^y - x}$ is
Option A:	$x.e^y - y - 1 = c$
Option B:	$(y+1)(x - e^y) = c$
Option C:	$ye^y + x - 1 = c$
Option D:	$xy - e^y + 1 = c$

39.	Changing the order of integration in double integral $\int_0^2 \int_0^{2-\sqrt{4-y^2}} f(x,y)dxdy$ leads to $\int_a^b \int_c^d f(x,y)dxdy$ then value of 'c' is
Option A:	$\sqrt{4-x^2}$
Option B:	$\sqrt{-4x+x^2}$
Option C:	$\sqrt{4x-x^2}$
Option D:	$-\sqrt{4x-x^2}$
41.	Solution of the differential equations $3x^2y^4dx + 4x^3y^3dy = 0$ is
Option A:	$x^2y^4 = c$
Option B:	$x^3y^3 = c$
Option C:	$x^4y^3 = c$
Option D:	$x^3y^4 = c$
42.	The complementary function for $(\mathrm{D}^2 + 2\mathrm{D} + 5)\mathrm{y} = 4\mathrm{e}^{-\mathrm{x}}\tan 2\mathrm{x} + 5$, where D=$\frac{d}{dx}$ is given by
Option A:	$k_1e^{-x}\sin 2y + k_2e^{-x}\cos 2y$
Option B:	$k_1e^{x}\sin 2x + k_2e^{x}\cos 2x$
Option C:	$k_1e^{-x}\sin 2x - k_2e^{-x}\cos 2x$
Option D:	$k_1e^{x}\sin 2x + k_2e^{-x}\cos 2x$
43.	If B(n,2) = $\frac{1}{6}$, n is positive integer then value of n is
Option A:	3
Option B:	2
Option C:	1
Option D:	4
44.	The value of I = $\int_0^1 \int_x^{\sqrt{x}} (x^2+y^2)dy\,dx$ is
Option A:	$\frac{3}{35}$
Option B:	$\frac{3}{15}$
Option C:	$\frac{1}{35}$
Option D:	$\frac{3}{5}$

45.	The region of integration in $\int_0^1 \int_0^{1-y} \int_0^{1-x-y} xyz\, dzdxdy$ represents
Option A:	Tetrahedron
Option B:	Cylinder
Option C:	Plane
Option D:	Sphere
47.	If the differential equations ydx + x(1-3x^2y^2) dy = 0 is non-exact then the integrating factor is
Option A:	$\frac{1}{3x^3y^2}$
Option B:	$\frac{1}{3x^3y^3}$
Option C:	$-\frac{1}{3x^3y^3}$
Option D:	$\frac{1}{3x^2y^3}$
48.	The value of the particular integral $\frac{1}{(D^3-1)}(e^x+1)^2$ is
Option A:	$\frac{e^{2x}}{7}-\frac{2e^x}{3}+1$
Option B:	$\frac{e^{2x}}{7}+\frac{2e^x}{3}-1$
Option C:	$\frac{e^{2x}}{7}-\frac{2xe^x}{3}+1$
Option D:	$\frac{e^{2x}}{7}+\frac{2xe^x}{3}-1$

49.	Value of $\Gamma\left(-\frac{8}{5}\right)$ is given by
Option A:	$\frac{25}{24}\Gamma\left(\frac{2}{5}\right)$
Option B:	$\frac{24}{25}\Gamma\left(\frac{1}{5}\right)$
Option C:	$\frac{25}{64}\Gamma\left(\frac{3}{5}\right)$
Option D:	$\frac{5}{8}\Gamma\left(\frac{13}{5}\right)$
50.	On changing the order of integration for $\mathrm{I} = \int_0^1 \int_0^{1+\sqrt{1-x^2}} f(x,y)dy\,dx$, $\mathrm{I} = \int_0^1 \int_a^1 f(x,y)dy\,dx$ where a=
Option A:	$1+\sqrt{1-y^2}$
Option B:	$\sqrt{2y-y^2}$
Option C:	$\sqrt{1-y^2}$
Option D:	$\sqrt{y^2-y}$
51.	Evaluate: $\int_2^6 \int_{x^2-6x+3}^{2x-9} dydx$
Option A:	$\frac{34}{3}$
Option B:	$\frac{25}{3}$
Option C:	$\frac{32}{3}$
Option D:	$\frac{2}{3}$
53.	The degree and order of the differential equation $\frac{d^4y}{dx^4} - 3x\left(\frac{d^3y}{dx^3}\right)^2 + \frac{dy}{dx} - 2y = 0$ are respectively
Option A:	4,1
Option B:	4,2
Option C:	2,4

Option D:	1,4
54.	The value of the particular integral $\frac{1}{(D^2+1)}$ $(2^x + \sinx\ \sin 2x)$ is
Option A:	$\frac{4xsinx - cos3x}{16} + \frac{2^x}{2\log 2 + 1}$
Option B:	$\frac{4xsinx - cos3x}{16} + \frac{2^x}{\log 2 + 1}$
Option C:	$\frac{4xsinx - cos3x}{16} + \frac{2^x}{(\log 2)^2 + 1}$
Option D:	$\frac{4xsinx + cos3x}{16} + \frac{2^x}{2\log 2 + 1}$
55.	Evaluate: $\int_0^1 \sqrt{1-\sqrt{1-\sqrt{x}}}\ dx$
Option A:	$\frac{308}{215}$
Option B:	$\frac{208}{315}$
Option C:	$\frac{215}{308}$
Option D:	$\frac{218}{305}$
56.	Changing to polar co-ordinates $\int_0^\infty \int_0^\infty e^{-(x^2+y^2)}\ dx\ dy$ the value of integral is
Option A:	$\frac{\pi}{4}$
Option B:	$\frac{\pi}{2}$
Option C:	$\frac{1}{4}$

Option D:	π
57.	Evaluate: $\iiint xyz\,dxdydz$ throughout the volume bounded by x=0,y=0,z=0,x+y+z=1
Option A:	$\frac{1}{5040}$
Option B:	$\frac{1}{720}$
Option C:	$\frac{1}{60}$
Option D:	$\frac{1}{144}$
59.	The particular integral $\frac{1}{D^6-64}\sin 2x =$
Option A:	$\frac{x\cos 2x}{16}$
Option B:	$\frac{\sin 2x}{128}$
Option C:	$\frac{-x\sin 2x}{128}$
Option D:	$\frac{-\sin 2x}{128}$
60.	Evaluate: $\int_0^{\log 2}\int_0^{x}\int_0^{x-y} e^{x+y+z}\,dzdydx$
Option A:	$2\log 2-\frac{5}{4}$
Option B:	$2\log 2+\frac{5}{8}$
Option C:	$\log 2-\frac{5}{4}$
Option D:	$2\log 2-\frac{1}{4}$

Descriptive Questions

1.	Using Beta function, Prove that $\int_0^{\infty}\frac{1}{1+x^2}dx=\frac{\pi}{2}$

2.	Change the order of integration in the integral $I = \int_{-a}^{a} \int_{0}^{\sqrt{(a^2-y^2)}} f(x, y)dxdy$
3.	Using the method of variation of parameters, solve $\frac{d^2y}{dx^2} + 4y = tan2x.$
4.	Solve $(D-2)^2 = 8(e^{2x} + sin2x + x^2).$
5.	Solve the Differential Equation $\frac{dy}{dx} + xsin2y = x^3cos^2y.$
6.	Evaluate the integral $\int_0^2 \int_0^z \int_0^{yz} xyz\, dx\, dy\, dz.$
7.	Evaluate the integral $\int_0^1 \int_0^{\sqrt{1-x^2}} \int_0^{\sqrt{1-x^2-y^2}} \frac{1}{\sqrt{1-x^2-y^2-z^2}}\, dx\, dy\, dz.$
8.	Solve the Differential Equation $(x^2e^x - my)dx + mx\, dy = 0$
9.	Change to polar coordinates and Evaluate $\int_0^a \int_y^a \frac{x\, dx\, dy}{(x^2+y^2)}.$
10.	Assuming the validity of differentiation under the integral sign, Prove that $\int_0^1 \frac{x^a-x^b}{logx} dx = log\frac{a+1}{b+1}$
11.	Solve the Differential Equation $(D^3 + D)y = cosx.$
12.	Solve the Differential Equation $x\frac{dy}{dx} + 2y = y^2x^3.$
13.	Prove that $\int_0^1 \frac{x^2dx}{\sqrt{(1-x^4)}} . \int_0^1 \frac{dx}{\sqrt{(1+x^4)}} = \frac{\pi}{4\sqrt{2}}.$
14.	Solve the Differential Equation $(1 + xy)ydx + (1 - xy)xdy = 0$
15.	Evaluate $\int\int xy\, dxdy$ over the positive quadrant of the circle $x^2 + y^2 = a^2.$
16.	Find the entire length of cardioid $r = a(1 + cos\theta)$
17.	Solve $\frac{d^4x}{dt^4} + 4x = 0.$
18.	Show that the area between the parabolas $y^2 = 4ax\ and\ x^2 = 4ay\ is\ \frac{16}{3}a^2.$
19.	Solve the DE $(2xy\cos x^2 - 2xy + 1)\, dx + (\sin x^2 - x^2\,)\, dy = 0$
20.	Using Method of variation of parameters solve $\frac{d^2y}{dx^2} + y = \tan x$
21.	Change the order of integration $I = \int_0^a \int_{-a+\sqrt{a^2-y^2}}^{a+\sqrt{a^2-y^2}} f(x, y)\, dx\ \ dy$
22.	Prove that $\int_0^\infty \frac{e^{-\beta x}\ \sin\alpha\, x}{x}\, dx = \tan^{-1}\left(\frac{\alpha}{\beta}\right)$

23.	Prove that $\int\int\int(x+y+z)\,dx\,dy\,dz = \frac{1}{8}$, over the tetrahedron bounded by $x=0, y=0, z=0 \ and \ x+y+z=1$.
24.	Prove that $\int_0^{\pi/2}\sqrt{\tan\theta}\ d\theta \,.\int_0^{\pi/2}\sqrt{\cot\theta}\ d\theta = \frac{\pi^2}{2}$
25.	Solve the DE $(D^2-4D+4)y = 8\,(e^{2x}+\sin 2x)\,, where\ D \equiv \frac{d}{dx}$
26.	Prove that $\int_0^{\infty}\frac{dx}{1+x^4} = \frac{\pi}{2\sqrt{2}}$.
27.	Solve the DE $\sin 2x\,\frac{dy}{dx} = y + \tan x$
28.	Evaluate the integral $I = \int\int xy\,(x+y)\,dx\,dy$ over the region bounded by the curves $y=x^2\ \&\ y=x$.
29.	Show that the length of the cardioid $r = a\,(1-\cos\theta)$ lies outside the circle $r = a\cos\theta$ is $4a\sqrt{3}$.
30.	Evaluate the integral $\int\int\int\frac{dx\,dy\,dz}{x^2+y^2+z^2}$ over throughout the volume of the sphere $x^2+y^2+z^2=a^2$.
31.	Solve the DE $(xy-2y^2)\,dx-(x^2-3xy)\,dy=0$
32.	Solve the DE $(D^2-2D+1)y = x^2\,e^{3x}\ , where\ D\equiv\frac{d}{dx}$
33.	Express into polar form and evaluate the integral $I = \int_0^a\int_0^{\sqrt{a^2-x^2}} e^{-(x^2+y^2)}\,dx\,dy$
34.	Evaluate the integral $\int\int\int\sqrt{x^2+y^2}\,dx\,dy\,dz$ over the region bounded by $x^2+y^2=z^2\,, z>0\ and\ z=0\,, z=1$.
35.	Prove that $\int_0^{\infty} x\,e^{-x^8}\,dx\,.\int_0^{\infty}x^2\,e^{-x^4}\,dx = \frac{\pi}{16\sqrt{2}}$
36.	Show that the length of the parabola $x^2=4y$ which lies inside the circle $x^2+y^2=6y$ is $2\left[\sqrt{6}+\log(\sqrt{2}+\sqrt{3})\right]$.
37.	Solve the following Differential equation $$y\frac{dy}{dx}+\frac{4x}{3}-\frac{y^2}{3x}=0$$
38.	Find total length of $r^2 = 16cos2\theta$
39.	Solve $\frac{d^2y}{dx^2}+4y = tan2x\ by\ Variation\ of\ parameters$
40.	Change the order of integration for the integral $\int_0^8\int_{(y-8)/4}^{y/4} f(x,y)$
41.	

	Evaluate $\iiint dxdydz$ over the solid of the paraboloid $x^2 + y^2 = 4z$ cut off by the plane z = 4
42.	Solve $xy - \frac{dy}{dx} = y^3 e^{-x^2}$
43.	Evaluate $\int_0^\infty \frac{log(1+ax^2)}{x^2} dx$
44.	.Solve $(D^2 - 4D + 1)y = e^{2x} sin5x$
45.	Change it to polar and Evaluate $\int_0^{2a} \int_0^{\sqrt{2ax-x^2}} (x^2 + y^2)dydx$
46.	Evaluate $\iint x\, dxdy$ throughout the area bounded by $y = x^2$ and $y = 4 - x$
47.	Solve: $\frac{dy}{dx} = \frac{y^3}{e^{2x}+y^2}$
48.	Solve: $\frac{d^2y}{dx^2} - y = \frac{2}{1+e^x}$, using method of variation of parameters
49.	Find the length of the cardioid r= a(1-cosθ) lying outside the circle r = acosθ.
50.	Change the order of integration and evaluate $\int_0^5 \int_{3-x}^{3+x} dx\, dy$
51.	Evaluate: $\iiint \frac{dx\, dy\, dz}{x^2+y^2+z^2}$ throughout the volume of the sphere $x^2 + y^2 + z^2 = a^2$
52.	Solve: $\frac{dx}{dy} + y^3 \sin^2 x + y\sin 2x = y^3$
53.	

	Solve : $\frac{d^2y}{dx^2} + 4\frac{dy}{dx} + 4y = \frac{e^{-2x}}{x^5}$
54.	Prove that $\int_0^{\infty} \frac{1-\mathrm{coa}ax}{x} e^{-x}\, dx = \frac{1}{2} \log(1+a^2)$, assuming the validity of differentiation under the integral sign.
55.	Evaluate : $\iint_R \frac{dx\, dy}{\sqrt{(1+x^2+y^2)^2}}$ over one loop of the lemniscate $(x^2+y^2)^2 = x^2 - y^2$
56.	Change to polar co-ordinates and evaluate $\int_0^1 \int_0^x x + y \ \ dydx$