Area finding

1) find area enclosed betw $y = x^2$ & $y = x + 6$

Maxima, Minima & Increasing, decreasing

1) Intervals on which $f(x) = 2x^3 + 3x^2 - 36x$ is increasing and is are decreasing.

2) State Extreme value theorem.

3) Find absolute maxim & minm values of, $f(x) = 2x^3 - 15x^2 + 36x$ on $[1, 5]$ & determine where the value occurs.

4) Find maxm & minm of; i) $f(x) = 2x^3 + 3x^2 - 12x, [-3, 2]$.

ii) $f(x) = 6x^{4/3} - 3x^{1/3}$; $[-1, 1]$

iii) $f(x) = 2x^3 - 15x^2 + 36x$; $[1, 5]$

iv) $f(x) = 4x^2 - 12x + 10$; $[1, 2]$

v) $f(x) = 8x - x^2$

vi) $f(x) = \frac{3x}{\sqrt{4x^2+1}}$

vii) $f(x) = 1 + |9 - x^2|$; $[-5, 2]$

viii) $f(x) = |6 - 4x|$; $[-3, 3]$

Multiple Integration

1) $\int_0^1 \int_{-x}^{x^2} y^2 x \, dy\,dx$ ✓

2) $\int_0^{\pi/3} \int_0^{\cos y} x \sin y \, dx\,dy$

3) Evaluate $\iint xy \, dA$ over the rectangle R enclosed between $y = \frac{x}{2}$, $y = \sqrt{x}$, $x = 2$ and $x = 4$

4) $\iint_R (2x - y^2) \, dA$ over the triangular region R enclosed by the lines ~~$y = x + 1$~~ $y = -x + 1$, $y = x + 1$ and $y = 3$

5) Evaluate $\iiint_G 12xy^2z^3 \, dV$ over the rectangle box G defined by the

6) inequalities $-1 \leq x \leq 2$, $0 \leq y \leq 3$, $0 \leq z \leq 2$

6) Let G be the wedge in the first octant that is cut from the cylinders solid $y^2 - z^2 \leq 1$ by the plane $y = x$ and $x = 0$, Evaluate $\iiint_G z \, dV$

7) Use a triple integral to find the volume of the solid within the cylinder $x^2 + y^2 = 9$, and between the planes $z = 1$ and $x + z = 5$.

8) $\int_{-1}^{2} \int_0^3 \int_0^2 12xy^2z^3 \, dz\,dy\,dx$

Partial Differentiation

~~i) f(x) =~~ i) $f(x,y) = x^3+y^3$

ii) $F(x,y) = 3x^2+2xy+5y^2$

iii) $F(x,y) = 9x^3+5x^2y+9y^2x+3y^2$

iv) $F(x,y) = 10x^4+5y^4$

v) $F(x,y,z) = 3x^3+3x^2yz+3xy^2z+3y^3+3z^2yx+3z^3$

vi) $F(x,y,z) = 4x^2y^2z+3xy^2z^3+9x^3y^2z$

vii) $f(x,y) = ax^2+2hxy+by^2$

viii) $f(x,y) = \log(x^2+y^2)$

ix) $F(x,y) = x^3+3x^2y+3xy^2+y^3$

x) Show that $f(x,y) = \ln(x^2+y^2)$, satisfies $\frac{\partial^2 P}{\partial x^2}+\frac{\partial^2 P}{\partial y^2}=0$

xi) $F(x,y) = y^{-3/2}\tan^{-1}(x/y)$

xii) 2nd order of $f' z = e^x \cos y$

xiii) $F(x,y) = e^{xy}\sin(4y^2)$ (xiv) $\frac{\partial^2 z}{\partial^2 x}$ & $\frac{\partial^2 z}{\partial^2 y}$ of $z = \sqrt{x}\cos y$

~~xiv) F(x,y) = 1~~ ~~(xv) f(x,y) =~~ (xv) $\frac{\partial z}{\partial x}$ & $\frac{\partial z}{\partial y}$, $z = x^4\sin(xy^3)$

(xvi) 2nd derivative of $z = x^2y^3+x^4y$

Definite integration

(1) $\int_{-1}^{1} x^2 dx$ (2) $\int_{-1}^{1} (2x^2 - x^3) dx$ (3) $\int_{0}^{\pi/2} \sin^2 x \, dx$ (4) $\int_{0}^{\pi/2} \frac{\cos^2\theta}{1-\sin\theta} d\theta$

(5) $\int_{2}^{3} 2x \, dx$ (6) $\int_{1}^{4} \frac{1}{x^3} dx$ (7) $\int_{1}^{3} (4 + 3x - x^3) dx$ (8) $\int_{0}^{1} \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$

(9) $\int_{-3}^{1} (x^2 + 2) dx$ (10) $\int_{-3}^{1} (5 - 2x) dx$ (11) $\int_{0}^{2} (2x - x^2) dx$ (12) $\int_{1}^{2} (x^2 + 2x + 5) dx$

(13) $\int_{-2}^{3} (x + 6 - x^2) dx$ (14) $\int_{0}^{\ln 2} e^y (1 + e^y)^{\frac{1}{2}} dy$ (15) $\int_{1}^{\sqrt{2}} \frac{1}{x^2\sqrt{4 - x^2}} dx$

(16) $\int_{4}^{9} (4y^{-1/2} + 2y^{1/2} + y^{-\frac{5}{2}}) dy$ (17) $\int_{0}^{1} \tan^{-1} x \, dx$ (18) $\int_{0}^{\sqrt{\pi}/2} 5x \cos(x^2) dx$

Gamma & Beta

$\pi = \frac{22}{7}$

1) Prove that $\Gamma(\frac{1}{2}) = \sqrt{\pi}$

(2) $\int_0^1 x^9 (1-x)^4 \, dx$ (3) $\int_0^1 x^7 (1-x)^3 \, dx$

(4) $\int_0^1 x^3 (1-x)^{1/2} \, dx$ (5) $\int_0^1 x^{3/2} (1-x)^{5/2} \, dx$

(6) $\int_0^\infty x^5 e^{-4x} \, dx$ (7) $\int_0^1 (1-x^3)^{-1/2} \, dx$

(8) $\int_0^{\pi/2} \sin^4\theta \cos^2\theta \, d\theta$ (9) $\int_0^2 x^5 (1-x)^{5/2} dx$

(10) $\int_0^{\pi/2} \sin^5 x \cos^4 x \, dx$ (11) $\int_0^{\pi/2} \sin^{12} x \, dx$ (12) $\int_0^1 x^4 (1-x)^{3/2} \, dx$

(13) $\int_0^{\pi/2} \sin^5 x \, dx$ (14) $\int_0^{\pi/2} \cos^3 x \, dx$ (15) $\int_1^e x^2 \ln x \, dx$

Integration

(i) $\int \frac{\sqrt{x^2-4}}{x}\,dx$ (ii) $\int \frac{1}{(\sqrt{x+1})^3}\,dx$ (iii) $\int \frac{x-1}{x^2+3x+2}\,dx$

(iv) $\int \frac{1}{(x+4)(x-1)}\,dx$ (v) $\int \sec^2 x\,dx$ (vi) $\int \frac{1}{x}\,dx$

(vii) $\int \frac{\cos x}{\sin^2 x}\,dx$ (viii) $\int \sqrt{1+\sin 2x}\,dx$ (ix) $\int \frac{1}{1-\sin x}\,dx$

(10) $\int 5x^3\,dx$ (11) $\int \frac{2}{x}\,dx$ (12) $\int \frac{x^4+1}{x^2}\,dx$ (13) $\int \frac{(1+x)}{x}\,dx$

(14) $\int (x^2+e^x+2^x)\,dx$ (15) $\int (4x^3+3x^2-2x+5)$

(16) $\int (1-3x)(1+x)\,dx$ (17) $\int (3x^{-1}+4x^2-3x+8)dx$

(18) $\int (8e^x-4a^x+3x^{-1}+\sqrt[4]{x})\,dx$ (19) $\int (2x+9)^5\,dx$

(20) $\int \sqrt{(5x+7)^3}\,dx$ (21) $\int (x^3+2)^3 \cdot 3x^2\,dx$ (22) $\int x^2 2e^x\,dx$

(23) $\int \frac{1}{x\log_e x \log_e(\log_e x)}\,dx$ (24) $\int x^2\sqrt{x-1}\,dx$ (25) $\int \frac{\sqrt{x^2-16}}{x}dx,\ x\geq 4$

(26) $\int y^4\sqrt[3]{5-4y^5}\,dy$ (27) $\int \frac{5x-10}{x^2-3x-4}\,dx$ (28) $\int x^2\ln x\,dx$ (29) $\int x^2\sqrt{1+x}\,dx$

(30) $\int \frac{\sqrt{x^2-25}}{x}\,dx,\ x\geq 5$ (31) $\int \frac{\cos\sqrt{y}}{\sqrt{y}}\,dy$ (32) $\int \frac{e^x}{\sqrt{1-e^{2x}}}\,dx$

(33) $\int x^2 e^{-2x}\,dx$ (34) $\int (x^{-9}-3x^{3/4}+8x^2)dx$ (35) $\int \frac{\sqrt{x^2-9}}{x},\ x\geq 3$

(36) $\int \frac{\sqrt{\tan^{-1}x}}{1+x^2}\,dx$ (37) $\int \frac{t-1}{t^2+3t+2}\,dt$ (38) $\int_0^{\sqrt{\pi}/2} 9x\sin(x^2)\,dx$

Limit,

(i) $\lim_{x \to 0} \left(\frac{1}{x} - \frac{1}{e^x - 1}\right)$ (ii) $\lim_{x \to 0} \frac{5x^3 - 2x^2 + 1}{3x + 5}$ (iii) $\lim_{x \to 0} (1+x)^{1/x}$

(iv) ~~$\lim_{x \to \infty}$~~

(iv) $\lim_{x \to \infty} \left(\sqrt{x^2 + x} - x\right)$ (v) $\lim_{x \to \infty} \left(\frac{x^3 - x + 7}{\sqrt{9x^6 + 1}}\right)$

(vi) $\lim_{x \to \infty} \frac{x^{-4/3}}{\sin(1/x)}$ (vii) $\lim_{x \to 0} (e^x + x)^{1/x}$

(viii) $\lim_{x \to 0} \left(\frac{x - \tan^{-1} x}{x^3}\right)$ (ix) $\lim_{x \to 1} \frac{x^3 + x^2 - 5x + 3}{x^3 - 3x + 2}$

(x) $\lim_{x \to 0} \left(\frac{1}{x} - \frac{1}{\sin x}\right)$ (xi) $\lim_{x \to \pi/4} (1 - \tan x) \sec 2x$

(xii) $\lim_{x \to 0} \left(\frac{x^2}{e^x + e^{-x} - 2}\right)$ (xiii) $\lim_{x \to \infty} \left(\sqrt[3]{\frac{3x+5}{6x-8}}\right)$

(xiv) $\lim_{x \to \infty} \left(\sqrt{x^2 + 3x} - x\right)$ (xv) $\lim_{x \to 0} x \ln x$ (xvi) $\lim_{x \to 0} \left(\frac{x - \cos 3x}{x^3}\right)$

(xvii) $\lim_{t \to 2} \left(\frac{t^3 - 3t^2 - 12t + 4}{t^3 - 4t}\right)$ (xviii) $\lim_{x \to +\infty} \left(\sqrt{x^6 + 5x^3} - x^3\right)$

(xix) $\lim_{x \to 0} \frac{1 - \cos x}{x^2}$ (xx) $\lim_{s \to \infty} \sqrt[3]{\frac{2 + 3s - 5s^2}{1 + s^8}}$