Compiled by: M. Usman Rafiq (M.PHIL Mathematics), KIPS College Samundri. 03090752390

Important Short Questions Mathematics from Past Papers for Inter Part-II

Chapter#01 (Functions and Limits)

i. If $f(x) = \begin{cases} x+2, & x \leq -1 \\ c+2, & x > -1 \end{cases}$ then find c so that $\lim_{x\to -1} f(x)$ exist.

ii. Evaluate $\lim_{x\to\infty} \left(\frac{x}{1+x}\right)^x$

iii. If $g(x) = \frac{3}{x-1},\ x \neq 1$ then find $gog(x)$

iv. Determine whether $f(x) = \frac{3x}{x^2+1}$ is even or odd.

v. Show that parametric equation $x = acos\theta,\ y = bsin\theta$ represent the equation of ellipse

vi. $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$

vii. If $f(x) = \sqrt{x+1},\ g(x) = \frac{1}{x^2}$ find $fog(x)$.

viii. Evaluate the limit: $\lim_{x\to 0} \frac{sinax}{sinbx}$

ix. Discuss the continuity of $f(x) = \begin{cases} 2x-5, & x \leq 2 \\ 4x+1, & x > 2 \end{cases}$ at $x = 2$

x. Show that parametric equation $x = asec\theta,\ y = btan\theta$ represent the equation of hyperbola

xi. $\frac{x^2}{a^2} - \frac{y^2}{b^2} = 1$

xii. Express the limit: $\lim_{x\to 0}(1+3x)^{\frac{2}{x}}$ in terms of e.

xiii. Evaluate $\lim_{x\to -2} \frac{2x^3+5x}{3x-2}$

xiv. Define constant function with example.

xv. Evaluate $\lim_{x\to 1} \frac{x^3-3x^2+3x-1}{x^3-x}$

xvi. Prove that $sech^2x = 1 - tanh^2x$

xvii. Find $f^{-1}(x)$ if $f(x) = -2x + 8$

xviii. Find $f^{-1}(x)$ if $f(x) = (-x+9)^3$

xix. Evaluate $\lim_{x\to\pi} \frac{sinx}{\pi - x}$

xx. Express the perimeter P of square as a function of its area A.

xxi. Evaluate $\lim_{x\to 3} \frac{x-3}{\sqrt{x}-\sqrt{3}}$

Chapter#02 (Differentiation)

i. Find $\frac{dy}{dx}$ if $x = \theta + \frac{1}{\theta}$ and $y = \theta + 1$

ii. Differentiate $cos\sqrt{x} + \sqrt{sinx}$ w.r.t 'x'.

iii. Differentiate $\sqrt{tanx}$ w.r.t 'x'.

iv. Find $f'(x)$ if $f(x) = \ln(e^x + e^{-x})$

v. Find y_2 if $x^3 - y^3 = a^3$

vi. Prove that $cosx = 1 - \frac{x^2}{2!} + \frac{x^4}{4!} - \frac{x^6}{6!} + \cdots$

vii. Determine the interval in which $f(x) = sinx$ is decreasing; $x\epsilon(-\pi, \pi)$

viii. Use definition to find derivative of $x(x-3)$ w.r.t 'x'.

ix. Differentiate $x^4 + 2x^3 + x^2$ w.r.t 'x'.

x. Differentiate $(1+x^2)^n$ w.r.t 'x'.

xi. Find $\frac{dy}{dx}$ when $x = ysiny$

xii. If $y = e^{-2x}sin2x$, find $\frac{dy}{dx}$

xiii. Find $\frac{dy}{dx}$ when $y = sinh^{-1}(x^3)$

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xiv. Use Maclaurin series to prove that $e^x = 1 + x + \frac{x^2}{2!} + \frac{x^3}{3!} + \frac{x^4}{4!} \ldots$

xv. Find the interval where $f(x) = 4 - x^2,\ x\epsilon(-2,2)$ is increasing or decreasing in the given domain.

xvi. Differentiate $\frac{1}{x-a}$ by definition.

xvii. If $y = (\sqrt{x} - \frac{1}{\sqrt{x}})^2$ then find $\frac{dy}{dx}$

xviii. If $y = (3x^2 - 2x + 7)^6$, then find $\frac{dy}{dx}$ by making a suitable substitutions.

xix. If $y = e^x(1 + lnx)$ then find $\frac{dy}{dx}$

xx. If $y = x^2e^{-x}$ then find y_2

xxi. Define increasing and decreasing function.

xxii. If $x = at^2,\ y = 2at$ then find $\frac{dy}{dx}$

xxiii. Find derivative by definition $\frac{1}{x^{40}}$

xxiv. Differentiate w.r.t 'x', $\frac{\sqrt{1+x}}{\sqrt{1-x}}$

xxv. Find $\frac{dy}{dx},\ xy + y^2 = 2$

xxvi. Differentiate $\cos^{-1}\left(\frac{x}{a}\right)$

xxvii. Find $\frac{dy}{dx}$ if $y = xe^{sinx}$

xxviii. Determine the interval in which $f(x) = cosx$ is increasing or decreasing for the domain $x\epsilon\left(-\frac{\pi}{2}, \frac{\pi}{2}\right)$.

xxix. If $y = \sqrt{x + \sqrt{x}}$, then find $\frac{dy}{dx}$

xxx. Differentiate $sinx$ w.r.t $cotx$

xxxi. Determine the interval in which $f(x) = x^2 + 2x + 2,\ x\epsilon(-4,1)$ is increasing.

xxxii. If $y = tanh(x^2)$, then find $\frac{dy}{dx}$

Ch#03 (Integration)

i. Find dy and δy for the function $y = \sqrt{x}$ when x changes from 4 to 4.41

ii. Evaluate $\int(3x^2 - 2x + 1)dx$

iii. Evaluate the integral $\int \frac{1-x^2}{1+x^2}dx$

iv. Evaluate $\int x^3 lnx\ dx$

v. Evaluate $\int \frac{2x}{x^2-a^2}dx$

vi. Use differentials, find $\frac{dy}{dx}$ and $\frac{dx}{dy}$ of $x^2 + 2y^2 = 16$

vii. Evaluate $\int sin^2 x dx$

viii. Find $\int \frac{dx}{x(lnx)^2}$

ix. Evaluate $\int \sin^{-1} x\ dx$

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

xi. Find δy and dy of $y = x^2 - 1$ when x changes from 3 to 3.02

xii. Evaluate the indefinite integral $\int\left(\sqrt{x} + 1\right)^2 dx$

xiii. Evaluate $\tan^2 x\ dx$

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xiv. Evaluate $\int a^{x^2} x\, dx \;\; a > 0, \;\; a \neq 1$

xv. Evaluate $\int \frac{-2x}{\sqrt{4-x^2}} dx$

xvi. Evaluate $\int \frac{x}{(1+x^2)\tan^{-1} x} dx$

xvii. Find integral by parts $\int xsinx\, dx$

xviii. Evaluate $\int \frac{dx}{\sqrt{7-6x-x^2}}$

xix. Evaluate $\int \frac{e^{m\tan^{-1} x}}{(1+x^2)} dx$

xx. Evaluate $\int \frac{1}{xlnx} dx$

xxi. Evaluate $\int \frac{(1-\sqrt{x})^2}{\sqrt{x}} dx$

xxii. Evaluate $\int (\sqrt{x}+1)^2 dx$

xxiii. Evaluate $\int \frac{dx}{x^2+4x+13}$

xxiv. Evaluate $\int x^2 sinx dx$

xxv. Evaluate $\int e^{2x}(-sinx + 2cosx) dx$

xxvi. Using differentials to find $\frac{dx}{dy}$ of $x^4 + y^4 = xy^2$

xxvii. Evaluate $\int (2x+3)^{\frac{1}{2}} dx$

xxviii. Evaluate $\int x\sqrt{x-a}\, dx$

xxix. Evaluate $\int (lnx)^2 dx$

xxx. Using differentials to find $\frac{dy}{dx}$ if $xy + x = 4$

xxxi. Evaluate $\int (a-2x)^{\frac{3}{2}} dx$

xxxii. Evaluate $\int xlnx\, dx$

xxxiii. Evaluate $\int secx\, dx$

xxxiv. Using differentials to find $\frac{dy}{dx}$ if $xy - lnx = c$

xxxv. Evaluate $\int \left(\sqrt{x} + \frac{1}{\sqrt{x}}\right) dx$

xxxvi. Evaluate $\int \frac{e^x}{e^x+3} dx$

xxxvii. Evaluate $\int lnx\, dx$

xxxviii. Find δy and dy in the case o $y = x^2 + 2x$ when x changes from 2 to 1.8

xxxix. Evaluate $\int \frac{1}{\sqrt{x}(\sqrt{x}+1)} dx$

xl. Evaluate $\int \frac{x}{x+2} dx$

xli. Evaluate indefinite integral $\int \frac{sec^2 x}{\sqrt{tanx}} dx$

xlii. Evaluate the integral $\int \frac{(\sqrt{\theta}-1)^2}{\sqrt{\theta}} d\theta$

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xliii. Evaluate the integral $\int \frac{x+2}{\sqrt{x+3}} dx$

xliv. Using by parts method to evaluate $\int x^2 lnx\, dx$

xlv. Evaluate the integral $\int \frac{3x+2}{\sqrt{x}} dx$

xlvi. Evaluate $\int \frac{x+b}{(x^2+2bx+c)^{\frac{1}{2}}} dx$

xlvii. Evaluate $\int e^x (cosx + sinx) dx$

xlviii. Evaluate $\int \frac{(a-b)x}{(x-a)(x-b)} dx$

xlix. Use differentials to approximate the value of $\sqrt[4]{17}$

l. Solve $\int \frac{dx}{\sqrt{x+a}-\sqrt{x}}$

li. Evaluate $\int \frac{cot\sqrt{x}}{\sqrt{x}} dx$

lii. Solve the definite integral $\int_1^3 (x^3 + 3x^2) dx$

liii. Find the area between the x-axis and the curve $y = cos\frac{1}{2}x$ from $x = -\pi$ to $x = \pi$

liv. Evaluate $\int_1^2 lnx dx$

lv. Find area above the x-axis, bounded by the curve $y^2 = 3 - x$ from $x = -1$ to $x = 2$

lvi. Solve differential equation $1 + cosxtany\frac{dy}{dx} = 0$

lvii. Evaluate $\int_{-1}^1 \left(x^{\frac{1}{3}} + 1\right) dx$

lviii. Evaluate $\int_{-1}^2 (x + |x|) dx$

lix. Find the area between x-axis and the curve $y = x^2 + 1$ from $x = 1$ to $x = 2$

Chapter#04 (Introduction to Analytic Geometry)

i. Find 'h' such that points $A(-1,1), B(3,2), C(7,3)$ are collinear.

ii. Find the slope and inclination of the line joining the points $(4,6)$, and $(4,8)$.

iii. Find the equation of line through $(-4,7)$ and parallel to the line $2x - 7y + 4 = 0$

iv. Check whether the lines $4x - 3y - 8 = 0$; and $x - y - 2 = 0$ are concurrent or not.

v. Find the angle between the pair of lines $x^2 - 2xyseca + y^2 = 0$

vi. Find point three fifth way along the line segment from $A(-5,8)$ to $B(5,3)$.

vii. Two points P and O' are given in xy-coordinates system. Find XY-coordinates of P. $P\left(\frac{3}{2}, \frac{5}{2}\right)$; $O'\left(-\frac{1}{2}, \frac{7}{2}\right)$

viii. Find an equation of line through $(-4,-6)$ and perpendicular to the line having slope $-\frac{3}{2}$.

ix. Express the system $3x + 4y - 7 = 0$; $2x - 5y + 8 = 0$; $x + y - 3 = 0$ in matrix form and check whether three lines are concurrent.

x. Show that points $A(0,2), B\left(\sqrt{3}, -1\right)$, and $C(0,-2)$ are vertices of a right triangle.

xi. The coordinate of point P are $(-6,9)$, the axes are translated through the point $O'(-3,2)$. Find the coordinates of P referred to new axes.

xii. Find equation of straight line if its slope is 2 and y-intercept is 5.

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xiii. Find the equation of the line through the points $(-2,1)$ and $(6,-4)$.

xiv. Find the mid-point of the line segment joining the points $A(3,1), B(-2,-4)$. also find the distance between them.

xv. Find slope and inclination of the line joining the points $(3,2),(2,7)$.

xvi. Find an equation of horizontal line through $(7,-9)$.

xvii. Find an equation of the line bisecting second and fourth quadrant.

xviii. Find equation of lines represented by $10x^2 - 23xy - 5y^2 = 0$

xix. Find measure of the angle between the lines represented by $3x^2 \mp 7xy + 2y^2 = 0$

xx. Find the point trisecting the join of $A(-1,4)$, and $B(6,2)$.

xxi. Convert $15y - 8x + 3 = 0$ in normal form.

Chapter#05 (Linear Inequalities and Linear Programming)

i. Indicate solution set of linear inequalities $3x + 7y \geq 21;\ \ x - y \leq 2$.

ii. Define optimal solution.

iii. Graph the solution set of linear inequality $5x - 4y \leq 20$ in xy-plane.

iv. Define corner point of solution region.

v. Graph the solution region of $4x - 3y \leq 12,\ x \geq -\frac{3}{2}$.

vi. Define problem constraints.

vii. Indicate the solution set by shading of $2x + y \leq 6$

Chapter#07 (Vectors)

i. Find unit vector in the direction of vector $\underline{v} = -\frac{\sqrt{3}}{2}\underline{i} - \frac{1}{2}\underline{j}$

ii. Find direction cosines of vector $\underline{v} = 6\underline{i} - 2\underline{j} + \underline{k}$

iii. Show that the set of points $P(1,3,2),\ Q(4,1,4)$ and $R(6,5,5)$ form a right triangle.

iv. Compute cross product $\underline{b} \times \underline{a}$ if $\underline{a} = 3\underline{i} - 2\underline{j} + \underline{k},\ \underline{b} = \underline{i} + \underline{j}$

v. Prove that vectors $\underline{i} - 2\underline{j} + 3\underline{k}, -2\underline{i} + 3\underline{j} - 4\underline{k},\ \underline{i} - 3\underline{j} + 5\underline{k}$ are coplanar.

vi. If O is origin and $\overrightarrow{OP} = \overrightarrow{AB}$, find the point P when A and B are $(-3,7)$ and $(1,0)$ respectively.

vii. Find direction cosines of vector $\underline{v} = \underline{i} - \underline{j} - \underline{k}$

viii. Find cosine of the angle θ between vectors $\underline{u} = 3\underline{i} + \underline{j} - \underline{k};\ \ \underline{v} = 2\underline{i} - \underline{j} + \underline{k}$

ix. A force $\underline{F} = 7\underline{i} + 4\underline{j} - 3\underline{k}$ is applied at $P(-1,2,3)$, find its moment about $Q(2,1,1)$

x. Find the volume of parallelepiped determined by $\underline{u} = \underline{i} + 2\underline{j} - \underline{k};\ \underline{v} = \underline{i} - 2\underline{j} + 3\underline{k};\ \underline{w} = \underline{i} - 7\underline{j} - 4\underline{k}$

xi. Find a unit vector in direction of $\underline{v} = [3,-4]$

xii. Write a unit vector whose magnitude is 2 and direction is same as $\underline{v} = -\underline{i} + \underline{j} + \underline{k}$

xiii. If $\underline{a} = 4\underline{i} + 3\underline{j} + \underline{k};\ \ \underline{b} = 2\underline{i} - \underline{j} + 2\underline{k}$, find $|\underline{a} \times \underline{b}|$

xiv. Find a scalar α so that the vectors $2\underline{i} + \alpha\underline{j} + 5\underline{k}$ and $3\underline{i} + \underline{j} + \alpha\underline{k}$ are perpendicular.

xv. A force $\underline{F} = 4\underline{i} - 3\underline{k}$ passes through the point $A(2,-2,5)$. find the moment of force $\underline{F}$ about the point $B(1,-3,1)$.

xvi. Find the value of $2\underline{i} \times \underline{j}.\underline{k}$

xvii. Find a unit vector in the direction of $\underline{v} = \underline{i} + 2\underline{j} - \underline{k}$

xviii. If $\overrightarrow{AB} = \overrightarrow{CD}$, then find the coordinate of the point A when points B, C, D are $(1,2),(-2,5),(4,1)$ respectively.

xix. Find the volume of parallelepiped determined by $\underline{u} = 3\underline{i} + 2\underline{k};\ \underline{v} = \underline{i} + 2\underline{j} + \underline{k};\ \underline{w} = -\underline{j} + 4\underline{k}$

xx. Find a vector of length 5, in the direction opposite that of $\underline{v} = \underline{i} - 2\underline{j} + 3\underline{k}$

xxi. Find α, so that $|\alpha\underline{i} + (\alpha + 1)\underline{j} + 2\underline{k}| = 3$

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xxii. Show that the vectors $2\underline{i} - \underline{j} + \underline{k}$, $\underline{i} - 3\underline{j} - 5\underline{k}$ and $3\underline{i} - 4\underline{j} - 4\underline{k}$ form the side of a right triangle.

xxiii. Calculate area of parallelogram whose vertices are $P(0,0,0)$, $Q(-1,2,4)$, $R(2,-1,4)$ and $S(1,1,8)$.

xxiv. Prove that $A(-3,5,-4), B(-1,1,1), C(-1,2,2)$ and $D(-3,4,-5)$ are coplanar.

xxv. Give a force $\underline{F} = 2\underline{i} + \underline{j} - 3\underline{k}$ acting at a point $A(1,-2,1)$, find the moment of $\underline{F}$ about the point $B(2,0,-2)$.

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