

ALLAMA IQBAL OPEN UNIVERSITY, ISLAMABAD
(Department of Mathematics & Statistics)

WARNING

1. PLAGIARISM OR HIRING OF GHOST WRITER(S) FOR SOLVING THE ASSIGNMENT(S) WILL DEBAR THE STUDENT FROM AWARD OF DEGREE/CERTIFICATE, IF FOUND AT ANY STAGE.
2. SUBMITTING ASSIGNMENTS BORROWED OR STOLEN FROM OTHER(S) AS ONE'S OWN WILL BE PENALIZED AS DEFINED IN "AIOU PLAGIARISM POLICY".

Course: Mathematic-1 (1308)
 Level: F.A/F.Sc

Semester: Spring, 2014
 Total Marks: 100
 Pass Marks: 40

ASSIGNMENT No. 1
 (Units 1–5)

Note: Attempt all questions and each question carries equal marks.

- Q.1 a) Prove the following identity.

$$\frac{\tan \frac{\theta}{2} + \cot \frac{\theta}{2}}{\tan \frac{\theta}{2} - \cot \frac{\theta}{2}} = -\sec \theta$$

- b) Find the periods of the following functions:

i) $\sin \frac{x}{5}$ ii) $\sec 9x$

- Q.2 a) Show that $\tan^{-1} A + \tan^{-1} B = \tan^{-1} \frac{A+B}{1-AB}$

b) Show that: (i) $\frac{1}{2rR} = \frac{1}{ab} + \frac{1}{bc} + \frac{1}{ca}$ (ii) $\frac{1}{r} = \frac{1}{r_1} + \frac{1}{r_2} + \frac{1}{r_3}$

- c) Reduce $\sin^4 \theta$ to an expression involving only function of multiples of θ ,

- Q.3 a) Find x , if $\tan^2 45^\circ - \cos^2 60^\circ = x \sin 45^\circ \cos 45^\circ \tan 60^\circ$.

- b) If $\cot \theta = \frac{5}{2}$ and the terminal arm of the angle is in the 1st quadrant, find the value of

$$\frac{3\sin \theta + 4\cos \theta}{\cos \theta - \sin \theta}$$

- Q.4 a) Prove that: $abc(\sin \alpha + \sin \beta + \sin \gamma) = 4\Delta s$

- b) The sides of a triangle are $x^2 + x + 1$, $2x + 1$ and $x^2 - 1$. Prove that the greatest angle of the triangle is 120° .

- Q.5 a) If α, β, γ are the angles of a triangle ABC, show that

$$\cot \frac{\alpha}{2} + \cot \frac{\beta}{2} + \cot \frac{\gamma}{2} = \cot \frac{\alpha}{2} \cot \frac{\beta}{2} \cot \frac{\gamma}{2}$$

- b) Prove that
- $\cos 20^\circ + \cos 100^\circ + \cos 140^\circ = 0$
 - $\frac{\sin \theta + \sin 3\theta + \sin 5\theta + \sin 7\theta}{\cos \theta + \cos 3\theta + \cos 5\theta + \cos 7\theta} = \tan 4\theta$

ASSIGNMENT No. 2

(Units 6–9)

Total Marks: 100

Pass Marks: 40

Note: Attempt all questions and each question carries equal marks.

Q.1 a) Evaluate the following limits

i) $\lim_{\theta \rightarrow 0} \frac{1 - \cos \theta}{\theta}$ ii) $\lim_{\theta \rightarrow 0} \frac{1 - \cos p\theta}{1 - \cos q\theta}$

(b) If $f(x) = \begin{cases} \frac{\sqrt{2x+5} - \sqrt{x+7}}{x-2} & x \neq 2 \\ k & x = 2 \end{cases}$

Find value of k so that f is continuous at $x = 2$.

Q.2 a) Apply the Maclaurin series expansion to prove that

$$\sqrt{1+x} = 1 + \frac{x}{2} - \frac{x^2}{8} + \frac{x^3}{16} + \dots$$

- Find y_4 if $y = \ln(x^2 - 9)$
- Show that $y = x^x$ has a minimum value at $x = \frac{1}{e}$

Q.3 a) Prove the following

i) $\sin^{-1} \frac{4}{5} + \sin^{-1} \frac{5}{13} + \sin^{-1} \frac{16}{65} = \frac{\pi}{2}$

ii) $2 \tan^{-1} \frac{1}{3} + \tan^{-1} \frac{1}{7} = \frac{\pi}{4}$

b) Find the value of each expression

i) $\tan(\cos^{-1} \frac{\sqrt{3}}{2})$ ii) $\sin[\tan^{-1}(-1)]$

c) Prove that $\tan^{-1} \frac{120}{119} = 2 \cos^{-1} \frac{12}{13}$

Q.4 a) Find the value of θ satisfying the following equations

i) $3 \tan^2 \theta + 2\sqrt{3} \tan \theta + 1 = 0$ ii) $4 \sin^2 \theta - 8 \cos \theta + 1 = 0$

b) Find the solution set of the following equations

i) $\sin 7x - \sin x = \sin 3x$ (ii) $\sin \theta + \sin 3\theta + \sin 5\theta + \sin 7\theta = 0$

Q.5 a) If $y = e^{ax} \sin bx$, Show that $\frac{d^2y}{dx^2} - 2a \frac{dy}{dx} + (a^2 + b^2)y = 0$

b) Differentiate $\frac{x^2+1}{x^2-1}$ w.r.t $\frac{x-1}{x+1}$

c) Show that $\frac{dy}{dx} = \frac{y}{x}$ if $\frac{y}{x} = \tan^{-1} \frac{x}{y}$