

Bago University
Department of Mathematics
First Semester Examination, March 2019

First Year (B.Sc)
(Chemistry and Physics Specialization)

Math 1001
Mathematics I
Time Allowed: (3) hours

Answer All Questions.

1. (a) In how many ways can four boys and four girls be seated in a row containing eight seats (i) if they may sit anywhere, (ii) if the boys and girls must alternate?
(b) Solve for n the equation $C(n+2, 4) = 6C(n, 2)$.
2. (a) Write and simplify the first four terms of $(x^{\frac{-2}{3}} + 2y^{\frac{2}{3}})^8$.
(b) Prove by mathematical induction that for all positive integral values of n ,
$$1 + 4 + 7 + \dots + (3n - 2) = \frac{n(3n-1)}{2}$$
.
3. (a) Find an equation of the line that is the perpendicular bisector of the line segment joining $(5, -1)$ and $(4, 8)$.
(b) Find an equation of the line that is tangent to the circle at the point P on the circle $x^2 + y^2 + 2x = 9$; $P(2, -1)$.
4. (a) Sketch the graph of the parabola $(x+2)^2 = -(y+2)$. Show the focus, vertex and directrix.
(b) Sketch the hyperbola $16(x+1)^2 - 8(y-3)^2 = 16$ and find the coordinates of the vertices, foci and equations for the asymptotes.
5. (a) Find the limits (i) $\lim_{t \rightarrow 0} \frac{\tan t \sec 2t}{3t}$ (ii) $\lim_{x \rightarrow 0} \frac{x \csc 2x}{\cos 5x}$.
(b) Show that $g(x) = \frac{(x^2 - 9)}{x - 3}$, $x \neq 3$ has a continuous extension to $x = 3$ and find that extension.
6. (a) Find $\frac{dy}{dx}$ if $y = \sqrt{(x^2 + 1)(x - 1)^2}$, by using logarithmic differentiation.
(b) Find $\sin \left[\sin^{-1} \left(-\frac{1}{2} \right) + \cos^{-1} \left(-\frac{1}{2} \right) \right]$.
