

Bago University
Department of Mathematics
First Semester Examination, March 2019

Third Year (B.Sc)
(Mathematics Specialization)

Math 3103
Differential Equations
Time Allowed: (3) hours

Answer All Questions.

1.(a) Solve the ordinary differential equation $(x-3)y' + 2y = 0$ by using power series method and determine the radius of convergence of the resulting series.

(b) Solve the initial value problem $(x^2 - 4)y'' + 3xy' + y = 0$, $y(0) = 4$, $y'(0) = 1$ near an ordinary point.

2.(a) Find the Frobenius series solution of $xy'' + 2y' + 9xy = 0$.

(b) Determine whether or not the equation $xy'' + (5-x)y' - y = 0$ has two linearly independent Frobenius series solutions.

3.(a) Show that $J_{\frac{1}{2}}(x) = \sqrt{\frac{2}{\pi x}} \sin x$.

(b) Find the exponents in the possible Frobenius series solutions of the equation $2x^2(1+x)y'' + 3x(1+x)^3y' - (1-x^2)y = 0$.

4.(a) (i) Find the Laplace transforms of $f(t) = \cosh kt$ by using definition.

(ii) Find the inverse transform of $F(s) = \frac{3s+1}{s^2+4}$.

(b) Find the Laplace inverse transform of $F(s) = \frac{2s+1}{s(s^2+9)}$ by using integration method.

5.(a) Find the initial value problem $x'' - x' - 6x = 0$, $x(0) = 2$, $x'(0) = -1$ by using Laplace transform.

(b) Find the convolution of $\cos t$ and e^{at} .

6.(a) Solve the initial value problem $x'' - 6x' + 8x = 2$, $x(0) = x'(0) = 0$ by using Laplace transform.

(b) Find the Laplace transforms of $f(t) = te^{-t}\sin^2 t$ by using theorem.
