

Column	Points	Score
1	10	
2	20	
3	12	
<b>Total</b>	42	

**Instructions:**

1. Do all of your work in this booklet.
2. **Show all of your steps** in problems for full credit.
3. **Be clear and neat** in your work. Any illegible work, or scribbling in the margins, will not be graded.
4. Place your **answers in a box**.
5. If you need more space, you may **use the back of the page** and write **On back Page #** in the problem space.

**1. Geometric Series. (4 pts)** Find the power series representation of  $f(x) = \frac{1}{1-2x}$  using geometric series. Determine the interval of convergence.

**2. Approximation. (6 pts)** Use appropriate series expansions to approximate the following to three decimal places:

a.  $\int_0^{0.5} \frac{dx}{1+x^2} \approx$

b.  $\sqrt{1.2}$

**3. Intervals of Convergence. (12 pts)** Determine the interval of convergence and radius of convergence of the following power series.

a.  $\sum_{n=0}^{\infty} \frac{x^n}{3^n}$ .

b.  $\sum_{n=0}^{\infty} n(x-1)^n$

c.  $\sum_{n=0}^{\infty} \frac{(-1)^n x^{2n}}{(2n)!}$ .

**4. Maclaurin Series. (8 pts)** For each series provide the terms up to and including powers of  $x^4$ .

a. Expand  $f(x) = \cosh x$  about  $a = 0$ .

b. Expand  $f(x) = \ln(1+x)$  about  $a = 0$ .

**5. Taylor Series Expansions. (6 pts)** Find the Taylor series expansions of the following using known series.

a.  $f(x) = e^{2x}$  about  $a = 1$ .

b.  $f(x) = x^2 \cos x$  about  $a = 0$ .

**6. Binomial Expansion. (6 pts)**

a. In the expansion  $(3x + 2y)^7$  what is the numerical coefficient of  $x^5 y^2$ ?

b. Expand  $\sqrt[3]{1+x^2}$  to four terms.

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