

Column	Points	Score
1	14	
2	13	
3	15	
4	8	
Total	50	

Instructions:

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

- Determine if the sequence is geometric. If it is, find a and r .

a. $-7, -5, -3, -1, 1, 3, \dots$

b. $3/4, 3/2, 3, 6, 12, \dots$

- Find the sum of the following:

a. $\frac{2}{3} - \frac{2}{9} + \frac{2}{27} - \dots + \frac{2}{3^7}$

- b. First five terms of the geometric sequence with $a = -4, r = 3$

- Find the doubling time for an investment at 6% using

a. The rule of 70.

b. The rule of 72.

- c. Compare these values to the exact value of

$$n = \frac{\ln 2}{\ln(1+r)}. \text{ Which is a better approximation?}$$

- The Taylor series of $f(x) = \sqrt[3]{1+x}$ at $x = 0$ is given by

$$f(x) = 1 + \frac{1}{3}x - \frac{1}{9}x^2 + \frac{5}{81}x^3 - \frac{10}{243}x^4 + \dots$$

- a. Write the approximation $P_3(x)$ to $f(x)$.

- b. Approximate $\sqrt[3]{1.3}$ to three decimal places using only the lowest degree Taylor polynomial possible. What degree polynomial is sufficient?

c. Find $\int_0^{0.1} \sqrt[3]{1+x} dx$ using $P_2(x)$.

- Determine which series converges. Where possible, find the sum of any convergent series.

a. $\frac{1}{3} + \frac{2}{9} + \frac{4}{27} + \frac{8}{81} + \dots$

b. $2 - 2 + 2 - 2 + 2 - 2 + \dots$

c. $1 - \frac{4}{3} + \frac{16}{9} - \frac{64}{27} + \dots$

6. Find the first four terms of the Taylor series expansion for $f(x) = (1+x)^4$ using the formula for the coefficients.

7. Find the Taylor series for the following functions and state the interval of convergence for each series.

a. $f(x) = \frac{1}{1+4x}$

b. $f(x) = x^2 e^{2x}$

8. Sara needs \$10,000 in 8 years. What amount should she deposit at the end of every year at 5% compounded annually to accumulate the \$10,000?

9. Express $0.\overline{0.123}$ as a geometric series and find its sum as a fraction.