

Show all work. Part A. Problems 1-5, 6 points each.

1. Find an expression for the sum  $\sum_{j=2}^{10} 5r^j$  .

2. What does it mean for an infinite series to converge? ( give definition in terms of partial sums)

3. Use the Taylor series that  $E^x = \sum_{n=0}^{\infty} \frac{x^n}{n!}$  to find a Taylor series for  $e^{x^2}$  .

4. Use an equilateral triangle with sides length 2 to show that the  $\sin\left(\frac{\pi}{6}\right) = \frac{1}{2}$

5. Evaluate the integral  $\int x \cos(x^2) dx$  .

**PartB 6-12 10 Points each**

6. If a car loses 15% of its value of the previous year and it has an initial value of \$20,000 what is it worth after 5 years and give formula for it's value after  $n$  years. When is it worth nothing according to this formula?

7. Find the necessary house payments to amortize a loan of \$170,000 at 6% for 30 years. How much interest will you pay?

8. Give the definition of a Taylor polynomial of degree  $n$  at 0 and compute the first three coefficients of  $f(x) = \cos(x)$ .

9. Write out the first four partial sums  $S_k$  for the infinite series  $\sum_{n=1}^{\infty} \frac{1}{n}$ . If the series  $\sum_{n=1}^{\infty} b_n$  has partial sums  $S_k = \frac{2 * k}{k + 1}$  does it converge or diverge? Why?

10. Find the Taylor series for  $\frac{x^2}{4-x}$  and describe where it converges.

11. Exercise 81 pg 13.1

12. Find a critical point of  $f(x) = \cos(2x) + x$  using the table of values for  $\cos(\theta)$ .

$\theta$	0	$\frac{\pi}{6}$	$\frac{\pi}{4}$	$\frac{\pi}{3}$	$\frac{\pi}{2}$
$\cos(\theta)$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0