

You may keep this page of questions. Turn in your answers with all of your work on the blue paper and tan paper. You are **NOT** allowed to use calculators on questions #1 – 6. Work these questions on the blue paper. After you have finished these first six questions, turn in the first part of the exam and receive a page of tan paper to use for the last two questions. You will need to use your calculator for parts of the last two questions.

I. (1) 10 Points. Find the sum of the series $\sum_{k=2}^{\infty} \frac{5}{3^k}$.

(2) 14 Points. Find the Maclaurin series for $f(x) = x \sin x^3$. You are expected to use a known power series and to express your final answer using summation notation.

(3) 14 Points. Find the degree 3 Taylor polynomial for $f(x) = x\sqrt{x}$ about $a = 1$.

(4) 14 Points. Find the interval of convergence, including endpoint behavior, for the power series

$$\sum_{k=1}^{\infty} (-1)^k \frac{(x-5)^k}{k^2 4^k}.$$

II. For each of the following series, either **prove** that the series converges or else **prove** that the series diverges. For an alternating series, distinguish between absolute and conditional convergence. State which test or tests you are using and show your work. These two questions are worth 14 points each.

$$(5) \sum_{k=0}^{\infty} \frac{(-1)^k 3^k}{2^k k!} \qquad (6) \sum_{k=0}^{\infty} \frac{2k}{k^2 + 4}$$

III.

(7) 10 Points. Find the partial sums S_{10} , S_{20} and S_{40} for the series $\sum_{k=0}^{\infty} \frac{\cos(2k)}{\sqrt{k^2 + 1}}$.

Based upon these calculations, do you expect that this series converges or that it diverges?

(8) 10 Points. If you save \$150.00 at the end of every month for 40 years and invest this money at 4.8% nominal annual interest compounded monthly, how much money will you have at the end of 40 years?