

Mathcad/calculator questions

(1) 10 Points. If you save \$150 at the end of every month for 20 years and invest this money at 6.30% nominal annual interest compounded monthly, how much money will you have at the end of 20 years?

(2) 10 Points. Given the infinite series $S = \sum_{k=1}^{\infty} \frac{(-1)^{k+1} \cos k}{k}$, use

Mathcad to find the values for the partial sums S_{2000} , S_{4000} and S_{6000} of this series. Based upon these partial sums, what would you say about the convergence or divergence of this series? Reset the Mathcad format to display results with 6 digits of precision rather than its default of 3 digits of precision.

$$S_{2000} =$$

$$S_{4000} =$$

$$S_{6000} =$$

You may keep this page of questions. Turn in your answers with all of your work on the colored paper. You are not allowed to use Mathcad or a calculator for this part of the exam. Each problem is worth 10 points.

II. Find Maclaurin series for the following functions. You are expected to use known power series and to express your final answers using summation notation.

(3) $f(x) = e^{-3x}$.

(4) $f(x) = x^2 \cos x$.

III. (5) For the sequence given by $a_k = \frac{(-1)^{k+1}}{k^2}$

- (a) Determine whether the sequence is increasing, decreasing, or neither.
- (b) Determine whether the sequence is bounded from above or below.
- (c) Indicate whether the sequence is convergent or divergent.

IV. For each of the following series, determine whether the series converges or diverges. For an alternating series, distinguish between absolute and conditional convergence. State which test or tests you are using and show your work.

(6) $\sum_{k=0}^{\infty} \frac{k^2 + 1}{k!}$ (7) $\sum_{k=1}^{\infty} \frac{4k + 3}{k^3 + 8}$

(8) $\sum_{k=1}^{\infty} \frac{(-1)^{k+1} 2^{3k-2}}{k 5^k}$ (9) $\sum_{k=0}^{\infty} \frac{(-1)^k}{7k + 20}$

V. (10) Find the interval of convergence for the power series

$$\sum_{k=0}^{\infty} \frac{(x - 2)^k}{(k + 1)3^k}.$$

Determine whether the series converges or diverges at the endpoints. Show your work!