# FALL 2026 - CALCULUS 2 - TEST #4B

Take home...all honorable references permitted..due 11:59 pm Tue, Dec 1 as pdf to tbeatty@fgcu.edu or in class. Please put your name in the pdf file somewhere and ask for a delivery receipt. Late returns risk I grade for semester.

1) (Financial Engineering) A company is planning to buy a machine costing $25,000. It is estimated that the machine will save $3,000 per year over the next 12 years after which it will be sold as salvage for $2000.If the company requires a 6% return on investment to justify the purchase, is it worth buying the machine? Ignore all other accounting or tax considerations. Hint: This is a finite geometric series problem. The money is spent at the beginning of year one. The $3000 per year savings accrues at the end of each year one thru twelve and needs to be discounted at 6% back to the beginning of year one to be comparable to the initial investment (this gives the net present value of the savings). Don't forget that the $2000 needs to be brought all the way back from the end of year twelve to the beginning of year one. If the overall net present value is positive, it means the investment is worthwhile. The overall net present value is the discounted value of the savings plus the discounted value of the salvage value minus the outlay for the machine at the beginning of the life of the investment.

2) Prove or disprove that $\sum_{n=1}^{\infty} \frac{n^n e^n}{n!}$ converges.

3) Prove or disprove that $\sum_{n=2}^{\infty} \frac{1}{n \ln(\ln n)}$ converges.

4) Two people on a remote island are discovered to have contracted a highly transmissible but nonfatal virus Monday morning at 9:00 am. By the next morning at 9:00 am, another three people have reported they are also infected with it. If the island population is fixed at 200 people who interact socially to a high degree, when will half the population be infected?

5) Find the sum $\sum_{n=1}^{\infty} \frac{4n^2+1}{16n^4-1}$