Name: _____
Student ID: _____

Test 3

This test is graded out of 100 marks. No books, notes, no graphing calculator or cell phones are allowed. You must show all your work, the correct answer is worth 1 mark the remaining marks are given for the work.

Question 1. *(10 marks)* Integrate the following indefinite integral:

$$\int \frac{x^2-1}{x^3+x}\,dt$$

Question 2. *(15 marks)* Integrate the following indefinite integral:

$$\int \frac{\sqrt{x^2-4}}{x}\,dx$$

Question 3. *(15 marks)* Use the Trapezoidal Rule and Simpson's Rule to approximate the value of the following definite integral for $n = 4$. Round your answer to six decimal places and compare the results to the exact value of the definite integral.

$$\int_0^2 x\sqrt{x^2+1}\,dx$$

Question 4. *(15 marks)* Evaluate the following limit.

$$\lim_{x \to 0^+} \left[\cos\left(\frac{\pi}{2} - x \right) \right]^x$$

Question 5. *(15 marks)* Evaluate the following improper integral if it converges.

$$\int_1^3 \frac{2}{(x-2)^{8/3}}\,dx$$

Question 6. *(15 marks)* Determine the convergence or divergence of the sequence with the following n^{th} term. If the sequence converges, find its limit.

$$a_n = \frac{n!\, e^{-n/2}}{(n-1)!}$$

Question 7. *(15 marks)* Find the sum of the infinite series.

$$\sum_{n=1}^{\infty}\left[\frac{3}{7^{n+1}}-\frac{4}{9^{n-1}}\right]$$