Name: _____

Student ID: _____

Test 3

This test is graded out of 45 marks. No books, notes, graphing calculators 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. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* Integrate the following indefinite integral:

$$\int_0^1 \arctan x \, dx$$

Question 2. *(5 marks)* Integrate the following indefinite integral:

$$\int \tan^3(4x) \sec^3(4x) \, dx$$

Question 3. *(5 marks)* Integrate the following indefinite integral:

$$\int \frac{x^3}{\sqrt{4+x^2}}\, dx$$

Question 4. *(5 marks)* Integrate the following indefinite integral:

$$\int \frac{x+1}{x(x^2+1)}\, dx$$

Question 5. *(5 marks)* Evaluate the limit, using L'Hôpital's Rule if necessary.

$$\lim_{x \to 0^+} (e^x + x)^{2/x}$$

Question 6. *(5 marks)* Solve the following improper integral:

$$\int_0^\infty xe^{-x}\,dx$$

Question 7. *(5 marks)* Solve the following improper integral:

$$\int_0^6 \frac{4}{(6-x)^2}\, dx$$

Question 8. *(5 marks)* Integrate the following indefinite integral:

$$\int \frac{1}{\cos x - 1}\, dx$$

Question 9. *(5 marks)* Determine the convergence or divergence of the sequence with the given n^{th} term. If the sequence converges find its limit.

$$b_n = ne^{-n/2}$$

Bonus Question. *(3 marks)*

$$\int \frac{e^x}{e^{2x}(e^x + 1)} \, dx$$