Name: _____
Student ID: _____

Test 3

This test is graded out of 50 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. If you need more space for your answer use the back of the page.

Question 1. *(5 marks)* Determine the indeterminate form, then evaluate the limit, using L'Hôpital Rule if necessary:

$$\lim_{x\to\infty} \frac{\ln x^4}{x^3}$$

Question 2. *(5 marks)* Determine the indeterminate form, then evaluate the limit, using L'Hôpital Rule if necessary:

$$\lim_{x \to \infty} x^2 e^{-2x}$$

Question 3. *(5 marks)* Integrate the following improper integral if it converges:

$$\int_0^{\infty} xe^{-x/2}$$

Question 4. *(5 marks)* Integrate the following improper integral if it converges:

$$\int_0^8 \frac{1}{\sqrt[3]{8-x}}\,dx$$

Question 5. *(5 marks)* Find the volume of the solid generated by revolving the region bounded by the graphs of the equations: $y = \sqrt{x}$, $y = 0$, $x = 4$ about the x-axis.

Question 6. *(5 marks)* Find the volume of the solid generated by revolving the region bounded by the graphs of the equations: $x + y = 4$, $y = x$, $y = 0$ about the x-axis.

Question 7. *(5 marks)* Find the arc length of the graph of the function $y = \frac{x^5}{10} + \frac{1}{6x^3}$ over the interval $[1, 2]$.

Question 8. *(5 marks)* An open tank has the shape of a circular cone with its tip oriented downward. The tank is 6 feet across the top and 9 feet high. How much work is done in filling the tank by pumping the water from 5 feet below the tank? (The water weighs 62.4 pounds per cubic feet)

Question 9. *(5 marks)* Integrate the following indefinite integral:

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

Question 10. *(5 marks)* Integrate the following indefinite integral:

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

Bonus Question. *(3 marks)* Evaluate the following limit:

$$\lim_{x\to 1^+} (\ln x)^{x-1}$$