Name: _____

Student ID: _____

Test 1

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.

Formula:

$$\sum_{i=1}^{n} c = cn \text{ where } c \text{ is a constant} \qquad \sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$\sum_{i=1}^{n} i^2 = \frac{n(n+1)(2n+1)}{6} \qquad \sum_{i=1}^{n} i^3 = \frac{n^2(n+1)^2}{4}$$

Question 1. *(3 marks)* Integrate the following indefinite integral:

$$\int \frac{1}{x^{2/5}} + x^{2/5} + \tan x \, dx$$

Question 2. *(5 marks)* Evaluate the definite integral using first principles *(i.e. limit process)*:

$$\int_{0}^{2} 2x^2 + x \, dx$$

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

$$\int \frac{e^{3x}}{e^{6x}+1}\,dx$$

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

$$\int \sqrt{\sec 3x}\,\sec 3x \tan 3x\,dx$$

Question 5. Given $\int_a^b f(x)\,dx = 3$, $\int_a^c g(x)\,dx = 3$ and $\int_b^c f(x)\,dx = 4$ evaluate the following definite integrals:

1. *(1 mark)*

$$\int_a^b 3f(x)\,dx$$

2. *(3 marks)*

$$\int_c^a f(x) - 2g(x)\,dx$$

Question 6. *(5 marks)* Evaluate the following definite integral:

$$\int_0^{\pi/4} \frac{\sec^2 x}{1 + \tan x}\,dx$$

Question 7. *(3 marks)* Use the Second Fundamental Theorem of Calculus to find $F'(x)$.

$$F(x) = \int_0^{\cos 3x} \arcsin y \, dy$$

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

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

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

$$\int \frac{e^{\sqrt{3x}}}{\sqrt{3x}}\,dx$$

Question 10. *(5 marks)* Evaluate the following definite integral:

$$\int_{-3}^{-2} \frac{x^4 + x^3}{4x^5 + 5x^4 + 1}\,dx$$

Bonus Question. *(3 marks)*
Integrate the following indefinite intergral:

$$\int \frac{1}{x(\operatorname{arcsec}x)(\ln \operatorname{arcsec}x)\sqrt{x^2 - 1}}\,dx$$