

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:

$$\sum_{i=1}^n c = cn \quad \text{where } c \text{ is a constant} \quad \sum_{i=1}^n i = \frac{n(n+1)}{2}$$
$$\sum_{i=1}^n i^2 = \frac{n(n+1)(2n+1)}{6} \quad \sum_{i=1}^n i^3 = \frac{n^2(n+1)^2}{4}$$

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

$$\int \frac{1}{\sqrt[7]{x}} + \sqrt[7]{x} + \sec x \, dx$$

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

$$\int_0^1 x^3 + 3x \, dx$$

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

$$\int \frac{1}{\sqrt{x}(1+x)} dx$$

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

$$\int \cot(\tan 2x) \sec^2 2x dx$$

Question 5. Given $\int_a^b g(x) \, dx = 4$, $\int_a^c f(x) \, dx = 2$ and $\int_b^c g(x) \, dx = 1$ evaluate the following definite integrals:

1. (1 mark)

$$\int_a^a 7f(x) \, dx$$

2. (3 marks)

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

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

$$\int_0^{\pi/8} \sin^2 2x \cos 2x \, dx$$

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

$$F(x) = \int_0^{\sin x^2} \frac{1}{1+y^2} dy$$

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

$$\int \frac{x^3 - 6x^2}{x^3} dx$$

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

$$\int e^{\sin 5x} \cos 5x \, dx$$

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

$$\int_1^2 (x^3 + x^2)(3x^4 + 4x^3)^3 \, dx$$

Bonus Question. (3 marks)

Integrate the following indefinite integral:

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