

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:

$$\int \frac{1}{\sqrt[9]{x}} + \sqrt[9]{x} + \csc x \, dx$$

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

$$\int_0^2 x^2 + 2x \, dx$$

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

$$\int \frac{1}{\sqrt{x}\sqrt{1-x}} dx$$

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

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

**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)

$$\int_a^a 6f(x) \, dx$$

2. (3 marks)

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

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

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

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

$$F(x) = \int_0^{\cos x^2} \arctan y \, dy$$

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

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

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

$$\int e^{\cos 3x} \sin 3x \, dx$$

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

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

**Bonus Question.** (3 marks)

Integrate the following indefinite integral:

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