

Name: _____
Student ID: _____

Test 1

This test is graded out of 40 marks. No books, notes 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 you might need:

$$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin \frac{u}{a} + C \quad \int \frac{du}{a^2+u^2} = \frac{1}{a} \arctan \frac{u}{a} + C$$

$$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a} \operatorname{arcsec} \frac{|u|}{a} + C$$

Question 1. (2 mark)

Integrate the following indefinite integral:

$$\int (3 \sin x + 5 \cos x) dx$$

Question 2. (5 marks)

Integrate the following indefinite integral:

$$\int \frac{1}{\theta^2} \cos \frac{1}{\theta} d\theta$$

Question 3. (5 marks)

Integrate the following indefinite integral:

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

Question 4. (5 marks)Integrate the following indefinite integral (*hint: use inverse trigonometric function*):

$$\int \frac{3}{2\sqrt{x}(4+x)} dx$$

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

1.

$$\int_c^a f(x) dx$$

2.

$$\int_b^a f(x) + g(x) dx$$

3.

$$\int_a^b g(x) dx$$

Question 6. (5 marks)

Evaluate the following definite integral:

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

Question 7. (3 marks)

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

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

Question 8. (5 marks)

Evaluate the following definite integral:

$$\int_{-1}^2 x(x^2 + 1)^3 \, dx$$

Question 9. (4 marks)

Evaluate the following indefinite integral:

$$\int e^{3-x} dx$$

Question 10. (3 marks)

Find the average value of the function $f(x) = 4x^2$ over the interval $[2, 4]$:

Bonus Question. (3 marks)

Integrate the following indefinite intergral:

$$\int \frac{\ln\left(\frac{e}{x^2}\right)}{x} dx$$