MATHEMATICS METHODS
YEAR 12, UNIT 3
TASK 4: TEST 2
Area under a curve, The fundamental theorem of calculus, The exponential function, Calculus of trigonometric equations.

Weighting: 8%

MELVILLE
SENIOR HIGH SCHOOL

SECTION A: Calculator Free Section

TIME: 35 min

MARKS: 38

Student Name: _____

TO BE PROVIDED BY THE STUDENT
Standard Items: Pens, pencils, eraser, ruler.

INSTRUCTIONS TO STUDENTS:
You are required to attempt ALL questions,
Write answers in the spaces provided beneath each question.
Marks are shown with the questions.

Show all working clearly, in sufficient detail to allow your answers to be checked readily and for marks to be answered for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks.

It is recommended that students **do not use a pencil,** except in diagrams.

Question 1 [1, 3, 2, 3, 3 marks]
Determine each of the following:

a) $\int_{\square}^{\square} 2e^{-0.2x}dx$ [1]

b) $\int_{\square}^{\square} 4xe^{x^2+1}+e^3dx$ [3]

c) $\int_{\square}^{\square} \cos(2x)\sin(2x)dx$ [2]

d) $\int_0^{\pi} \sin\left(\frac{x}{2}\right)dx$ [3]

e) $\int_{2x}^{0} \frac{d}{du}\sqrt{\square}$ [3]

Question 2 [2, 3, 3, 3, 3 marks]
Differentiate the following with respect to *x*. Do not simplify your answers.

a) $y = \frac{1}{5}e^{5x} + x^2$ [2]

b) $f(x) = (1 + x)e^{2x}$ [3]

c) $y = \sin^2(2x^2 - 3)$ [3]

d) $y = \dfrac{e^{3x^2}}{\cos(4x)}$ [3]

e) $\int_{5}^{3x^2} t$ ¿¿) dt [3]

Question 3 [4 marks]

It is given that f(x) = x cos x and f'(x) = cos x - x sin x.

Use the above facts to find $\int_{\square}^{\square} x \sin x \, dx$.

Question 4 [4 marks]

The area of the region bounded by the curve with equation $y = k\sqrt{\square}$, where k is a positive constant, the x-axis and the line with equation $x = 9$ is 27 units^2. Find the value of the constant k.

Question 5 [4 marks]

Determine the equation of the tangent to $y = 3e^{x^2-1} + 2$ at the point (1, 5).