



PIONEER INTERNATIONAL UNIVERSITY

THE DEGREE OF BACHELOR OF EDUCATION

UNIT CODE: MATH 2111

UNIT TITLE: CALCULUS 2

END OF SEMESTER EXAMINATION

DATE: DECEMBER, 2021

Time: 2 HOURS

INSTRUCTIONS

1. Answer question **ONE (1)** and any other **TWO (2)** questions
2. Show all your workings
3. Scientific Calculators and non-programmable calculators may be used

1. (a) Find the derivative of the function $y = \cos x^3$ (3 marks)
 (b) Evaluate: $\int (3x + 2)^5 dx$ (5 marks)
 (c) Find $f'(x)$ using implicit differentiation:
 i. $f(x) = x^2 + 2xy + 2y^2 = 1$ (5 marks)
 ii. $f(x) = x^2 + y^2 - 2x - 4y = 1$ (5 marks)
 (d) Using the identity property: $\sin^2 x + \cos^2 x = 1$, evaluate $\int \cos^5 x dx$ (6 marks)
 (e) Find the derivatives for the set of functions given below.
 i. $x = \sin 2t$;
 $y = -\cos t$
 ii. $x = e^{2t}$;
 $y = e^{3t}$ (6 marks)

2. (a) Integrate the following using substitution method:

$$\int x\sqrt{2x+1} dx$$
(7 marks)
 (b) Sketch the curve for the function $f(x) = \frac{1}{3}x^3 - x^2 + 3x + 4$ (13 marks)

3. Evaluate

(a) $\int \sinh x \cosh^2 x \, dx$ (10 marks)

(b) $\int \cos^4 2x \, dx$ (10 marks)

4. (a) Find the area below $f(x) = -x^2 + 4x + 3$ and above $g(x) = -x^3 + 7x^2 - 10x + 5$ over the interval $1 \leq x \leq 2$

(8 marks)

(b) Find the integral of the function $f(x) = \sin^4 x \cos^4 x$

(12 marks)