INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN SCIENCE (CFSI)
MAT 1210: MATHEMATICS 1
FINAL EXAMINATION: MAY 2016 SESSION

Instructions: This paper consists of **FIVE (5)** questions. Answer any **FOUR (4)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

a) Express $\dfrac{3x+5}{x\left(x^2+1\right)^2}$ expression as partial fraction.

(13 Marks)

b) Evaluate the definite integral $\int_0^2 x(x+3)(x-3)\,dx$.

(4 Marks)

c) Solve $\log_2 5+\log_2(2x-1)=1+\log_2(3x+1)$ without using calculator.

(5 Marks)

d) The functions f and g are defined as $f(x)=px+3$ and $g(x)=x+4p$. Given that, $f(2)=g(5)$. Find the value of p.

(3 Marks)

Question 2

a) Solve the exponential equation $4^x=\dfrac{1}{32}$.

(4 Marks)

b) Solve $\cos 2x+3=5\cos x$ for $0^\circ < x < 360^\circ$, giving your answer in degree.

(8 Marks)

c) Given that $\cos x=\dfrac{5}{13}$ where x is located at Quadrant 1, find the values of;

i) $\sin 2x$

(3 Marks)

ii) $\cos\dfrac{x}{2}$

(3 Marks)

iii) $\tan 2x$

(3 Marks)

d) Find the value of $\frac{dy}{dx}$ at the given value if $y = e^{x\sin x}$; $x = \pi$.

(4 Marks)

Question 3

a) Use the Binomial Theorem to expand the first four terms of $\left(1+x-2x^2\right)^7$; Let $y = x-2x^2$.

(5 Marks)

b) Determine the remainder, when $p(x) = 2x^3 + 4x^2 - 6x + 7$ is divided by $(2x-1)$.

(2 Marks)

c) Given that the equation of the curve is $y = \frac{(6x^2-5)^4}{3x}$.

i) Show that the gradient of the curve is $\frac{dy}{dx} = \frac{(ax^2-1)^3(bx^2+5)}{cx^2}$, where *a*, *b* and *c* are integers.

(8 Marks)

ii) Find the value of $\frac{dy}{dx}$ when $x = 1$; write your answer in 2 decimal point.

(2 Marks)

d) Given that $f(x) = e^x$ and $g(x) = 3x+1,\ x \in \Re$

i) Find $g^{-1}(x), x \in \Re$

(3 Marks)

ii) Show that $g^{-1}f(x) = \frac{e^{ax}-b}{c}$, where a, b and c are integers.

(2 Marks)

e) Find the area of the region bounded by $y = \frac{x^3}{8} + 2x,\ x = 2, x = 4$ and $x-axis$.

(3 Marks)

Question 4

a) Evaluate the definite integral of $\int_0^{\frac{\pi}{4}} x\sin 2x dx$ by using integration by parts.

(9 Marks)

b) Given that $y = \sqrt{\tan^{-1}\left(\frac{5x-1}{2}\right)}$;

i) Show that $\frac{dy}{dx} = \frac{a}{2}\left(\frac{b}{(1+ax)\sqrt{\tan^{-1}\left(\frac{5x-1}{2}\right)}}\right)$ where a, and b are integers.

(4 Marks)

ii) Hence, find the value of $\frac{dy}{dx}$ when $x = 1$. Gives your answer in 3 decimal places.

(2 Marks)

c) Find the coordinates of the turning points of $y = -x(x+4)^2$. Hence, determine the nature of the turning points.

(10 Marks)

Question 5

a) Find indefinite integral of $\int \frac{x^3}{\sqrt{9x^2+4}}$ by using u-substitution.

(9 Marks)

b) Find the equation of straight line which passes through a pair of points $(3,5)$ & $(8,15)$. Hence, states the *x* and *y* intercept and sketch the graph.

(10 Marks)

c) Show that the identity, $\cos^2 x = \sin^2 x + \cos 2x$

(4 Marks)

d) If $(2x+1)$ is a factor of higher degree equation $p(x) = 2x^3 + px^2 - 5$, find the value of *p*.

(2 Marks)

--THE END--

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