INTI INTERNATIONAL UNIVERSITY

FOUNDATION IN SCIENCE (CFSI)
MAT 1210: MATHEMATICS 1
FINAL EXAMINATION: JUNE 2015 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) Find the value of $(3.25)^{1+\log_{3.25}10}$

(3 Marks)

b) Express $\dfrac{\left(x^2+1\right)}{x\left(x+1\right)\left(x-1\right)}$ in partial fractions.

(9 Marks)

c) Evaluate the indefinite integral of $\int 2x\left(x^2+10\right)^{13}dx$ by using u-substitution.

(4 Marks)

d) Rationalize the denominator of $\dfrac{1}{\sqrt{2}+\sqrt{5}}$.

(3 Marks)

e) Prove that $\dfrac{\tan\theta+\cot\theta}{\sec\theta\csc\theta}=1$.

(6 Marks)

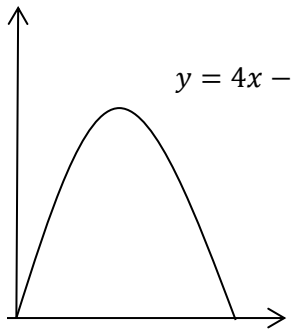
Question 2

a) By using implicit differentiation, differentiate $x^2+y^2=4$ with respect to x.

(3 Marks)

b) Find the area of the region bounded by the curves of $y=0$ and $y=4x-x^2$ as shown in the diagram below.

(6 Marks)



c) Solve $\frac{\left(x^3-4x^2+2x+5\right)}{\left(x+2\right)}$ by using long division and write the answers in fractional form.

(6 Marks)

d) Given that the function *f* and *g* are defined as $f(x)=px+3$ and $g(x)=x+4p$.

i) Given that $f(2)=g(5)$, find the value of *p*.

(4 Marks)

ii) Find $fg(x)$.

(2 Marks)

iii) Solve $f(x)=g(x)$.

(2 Marks)

e) Use the factor theorem to determine if $\left(2x-5\right)$ a factor of $p(x)=6x^4-15x^3-8x^2+20x$.

(2 marks)

Question 3

a) Use the binomial theorem to expand $\left(3x-y\right)^3$.

(3 Marks)

b) Given that the equation of the curve is $y=24\left(3x-5\right)^{-2}$.

i) Find the gradient of the curve if *x=2*.

(4 Marks)

ii) Find the equation of tangent and normal at the point *(1, 6)* and gives your answer in the form of *y=mx+c*.

(7 Marks)

c) Sketch $3y+2x-12=0$ and state the slopes and y-intercepts.

(5 Marks)

d) Integrate the indefinite integral of $\int x^3 \ln 3x \, dx$ by using the integration by parts.

(6 Marks)

Question 4

a) A point moves along the curve $y=\sqrt{x^2+8}$ in such way that $\frac{dx}{dt}=3$. Find $\frac{dy}{dt}$ when *x=1*.

(4 Marks)

b) Given the equation of the curve is $y=\left(x+1\right)^3\left(x+3\right)^5$.

i) Find the gradient of the curve.

(3 Marks)

ii) Find the value of $\frac{dy}{dx}$ when *x=4*.

(2 Marks)

c) By using the factor theorem, find the first root of $3x^3 - 2x^2 - 17x - 12 = 0$, then find all other roots by using long division.

(8 Marks)

d) The function f is defined by $f(x) = \frac{kx-5}{m-x}, x \neq m$. If $f(-1) = -\frac{7}{4}$ and $f(2) = -1$. Find the value of *k* and *m*;

(8 Marks)

Question 5

a) The line $y = 4$ and the curve $y = x^2$ meet at two points.

i) Find the points of intersection when the region bounded (or enclosed) by the line and the curve is rotated through 360° or 2π about the x-axis.

(2 marks)

ii) Find the volume of the solid generated.

(5 Marks)

b) Find the coordinates of turning point of $y = 16x + \frac{1}{x^2}$. Hence determine the nature of the turning point.

(7 Marks)

c) Given that $y = \sin x(1 + \cos x)$;

i) Find the first derivative of the function.

(5 Marks)

ii) Hence, find the value of $\frac{dy}{dx}$ when $x = \frac{\pi}{2}$.

(2 Marks)

d) Evaluate $\int \cos^3 x dx$

(4 marks)

--THE END--

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