DTEMS PAST PAPER
TECHNICAL

Sir Arthur Lewis Community College

Division of Technical Education and Management Studies

EXAMINATION	:	MAY 2015 - FINAL EXAMINATION (Altermnative)
COURSE TITLE	:	CALCULUS II
COURSE CODE	:	MAT 216
TUTORS	:	
TIME	:	2 HOURS
DATE	:	
INVIGILATORS	:	
ROOMS	:	

INSTRUCTIONS:

This exam consists of two sections. Answer all questions in section one and any two in section two.
Answer all questions on the foolscaps provided.
Show all necessary working.
You are permitted to use nonprogrammable calculators.

List of formulae

Trigonometry

$$\tan\theta = \frac{\sin\theta}{\cos\theta}$$

$$1+\tan^2 x \equiv \sec^2 x$$

$$\cos^2\theta + \sin^2\theta \equiv 1$$

$$\cot^2 x + 1 \equiv co\sec^2 x$$

Derivatives

$$\frac{d}{dx}(\tan x) = \sec^2 x$$

$$\frac{d}{dx}\left(\frac{f(x)}{g(x)}\right) = \frac{f'(x)g(x) - g'(x)f(x)}{\left[g(x)\right]^2}$$

$$\frac{d}{dx}(\sec x) = \sec x \tan x$$

$$\frac{d}{dx}\arccos x = -\frac{1}{\sqrt{(1-x^2)}}$$

$$\frac{d}{dx}\arcsin x = \frac{1}{\sqrt{(1-x^2)}}$$

$$\frac{d}{dx}\arctan x = \frac{1}{1+x^2}$$

Indefinite Integrals

$$\int x^n\,dx = \frac{x^{n+1}}{n+1} + C \; (n \neq -1)$$

$$\int \frac{1}{x}\,dx = \ln|x| + C$$

$$\int e^x\,dx = e^x + C$$

$$\int a^x\,dx = \frac{a^x}{\ln a} + C$$

$$\int \sin x\,dx = -\cos x + C$$

$$\int \cos x\,dx = \sin x + C$$

$$\int \sec^2 x\,dx = \tan x + C$$

$$\int \frac{1}{\sqrt{a^2 - x^2}}\,dx = \sin^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \sec x \tan x\,dx = \sec x + C$$

$$\int -\frac{1}{\sqrt{a^2 - x^2}}\,dx = \cos^{-1}\left(\frac{x}{a}\right) + C$$

$$\int \frac{1}{x^2 + a^2}\,dx = \frac{1}{a}\tan^{-1}\left(\frac{x}{a}\right) + C$$

$$\int u\frac{dv}{dx}\,dx = uv - \int v\frac{du}{dx}\,dx$$

1. (a) Find the first three non-zero terms in the Maclaurin Series for $f(x) = sinx$.

(b) Hence, write the Maclaurin series expansion for $g(x) = \frac{sinx^2}{x}$. [5]

2. Solve for x in the equation $5coshx + 3sinhx = 4$. [5]

3. Evaluate the expression $cosx(arcsin\frac{3}{5})$. [3]

4. Find the equation of the tangent to the curve $x^2 + xy + y = 0$ at the point $(1, 2)$.

[7]

5. After t months training the number of words that a court reporter can type per minute follows the function $p(t) = 85 - 10e^{-0.1t}$. Given that the average value of a function f where $a \leq x \leq b$ is defined by as

$$f_{ave} = \frac{1}{b-a}\int_{a}^{b} f(x)dx$$

calculate the average number of words which this court reporter can type during the first three months on the job? [5]

6. A smooth curve with parametric equations $x = f(t), y = g(t),\ a \leq t \leq b$ has its length given by

$$L = \int_a^b \sqrt{\left(\frac{dx}{dt}\right)^2 + \left(\frac{dy}{dt}\right)^2}\, dt\ .$$

Using the formula given above, determine the length of the curve given by the following equations $x = 2sint$ and $y = 2cost$ where $0 \leq t \leq 2\pi$. **[5]**

7. A curve passes through the origin and its gradient function is $2x - 1$. Find the equation of the curve and sketch it. **[5]**