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UNIVERSITI TUN HUSSEIN ONN MALAYSIA

FINAL EXAMINATION
SEMESTER I
SESSION 2012/2013

COURSE NAME	:	CALCULUS
COURSE CODE	:	BWC 10303
PROGRAMME	:	1 BWC
EXAMINATION DATE	:	DECEMBER 2012 / JANUARY 2013
DURATION	:	3 HOURS
INSTRUCTION	:	ANSWER **ALL** QUESTIONS

THIS QUESTION PAPER CONSISTS OF **FIVE (5)** PAGES

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Q1 (a) Evaluate, $\lim_{x\to 0}\frac{\sin(8x)\sin(3x)}{3x^2}$.

(4 marks)

(b) By using the chain rule, find $\frac{dy}{dx}$ if $y=(2-3\sin x)^4$

(7 marks)

(c) A curve is given by parametric equation, $x=\frac{t^2-2}{4t}$ and $y=\frac{2t}{3t-1}$. Find $\frac{dy}{dx}$ when $t=1$.

(9 marks)

Q2 (a) Use differentials to find the approximate value of

(i) $\sqrt{10}$

(ii) $\sqrt[3]{27.05}$

Give your answer for **Q2**(a) in four decimal places.

(14 marks)

(b) Find the equation of the normal to the curve $f(x)=x^3-2x^2+4$ at (3, 5).

(6 marks)

Q3 (a) (i) Show that $f(x)=\frac{1}{6}(3x+4)^2$ and $g(x)=\frac{3}{2}x^2+4x$ differ by a constant by showing that they are anti derivatives of the same function.

(ii) Find the constant C such that $f(x)-g(x)=C$ by evaluating $f(x)$ and $g(x)$ at a particular value of x.

(10 marks)

(b) Solve the following initial-value problem

(i) $\frac{dy}{dx}=\sqrt[3]{x}, y(1)=2$

(ii) $\frac{dy}{dx}=\cos x, y(0)=1$

(10 marks)

Q4 Evaluate the following integrals by using the appropriate techniques of integration

(a) $\int \frac{x^2}{\sqrt{x^3+1}}dx$

(5 marks)

(b) $\int x^3 \ln x dx$

(5 marks)

(c) $\int \cos^3 x \sin x dx$

(5 marks)

(d) $\int \frac{dx}{\sqrt{1-9x^2}}$

(5 marks)

Q5 (a) Find the area of the region bounded by the curves $g(y) = 3 - y^2$ and the line, $x = -1$.
[Hint : start by sketching the region bounded.]

(10 marks)

(b) Use the method of cylinders to determine the volume of the solid of revolution obtained by rotating the region bounded by $y = 4x$ and $y = x^3$ about the y-axis. Assume that $x \geq 0$.
[Hint : start by sketching the bounded region.]

(10 marks)

- END OF QUESTION -

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FORMULA

Differentiation Rules	Indefinite Integrals
$\frac{d}{dx}\left[x^n\right] = nx^{n-1}$	$\int x^n\,dx = \frac{x^{n=1}}{n+1} + C$
$\frac{d}{dx}\left[\ln\lvert x\rvert\right] = \frac{1}{x}$	$\int \frac{dx}{x} = \ln\lvert x\rvert + C$
$\frac{d}{dx}\left[\cos x\right] = -\sin x$	$\int \sin x dx = -\cos x + C$
$\frac{d}{dx}\left[\sin x\right] = \cos x$	$\int \cos x dx = \sin x + C$
$\frac{d}{dx}\left[\tan x\right] = \sec^2 x$	$\int \sec^2 x dx = \tan x + C$
$\frac{d}{dx}\left[\cot x\right] = -\cos ec^2 x$	$\int \cos ec^2 x dx = -\cot x + C$
$\frac{d}{dx}\left[\tan x\right] = \sec^2 x$	$\int \sec x \tan x dx = \sec x + C$
$\frac{d}{dx}\left[\sec x\right] = \sec x \tan x$	$\int \cos ecx \cot x dx = -\cos ecx + C$
$\frac{d}{dx}\left[\cos ecx\right] = -\cos ecx \cot x$	$\int e^x dx = e^x + C$
$\frac{d}{dx}\left[e^x\right] = e^x$	$\int \sinh x dx = \cosh x + C$
$\frac{d}{dx}\left[\cosh x\right] = \sinh x$	$\int \cosh x dx = \sinh x + C$
$\frac{d}{dx}\left[\sinh x\right] = \cosh x$	$\int \sec h^2 x dx = \tanh x + C$
$\frac{d}{dx}\left[\tanh x\right] = \sec h^2 x$	$\int \cos ech^2 x dx = -\coth x + C$
$\frac{d}{dx}\left[\coth x\right] = -\cos ech^2 x$	$\int \sec hx \tanh x dx = \sec hx + C$
$\frac{d}{dx}\left[\sec hx\right] = -\sec h^2 x \tanh x$	$\int \cos echx \coth x dx = -\cos echx + C$
$\frac{d}{dx}\left[\cos echx\right] = -\cos echx \coth x$	

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Trigonometric	Hiperbolic
$\cos^2 x + \sin^2 x = 1$	$\cosh^2 x - \sinh^2 x = 1$
$1 + \tan^2 x = \sec^2 x$	$1 - \tanh^2 x = \operatorname{sech}^2 x$
$\cot^2 x + 1 = \operatorname{cosec}^2 x$	$\coth^2 x - 1 = \operatorname{cosech}^2 x$
$\sin 2x = 2\sin x \cos x$	$\sinh 2x = 2\sinh x \cosh x$
$\cos 2x = \cos^2 x - \sin^2 x$	$\cosh 2x = \cosh^2 x + \sinh^2 x$
$\tan 2x = \dfrac{2\tan x}{1 - \tan^2 x}$	$\tanh 2x = \dfrac{2\tanh x}{1 + \tanh^2 x}$
$\sin(x \pm y) = \sin x \cos y \pm \cos x \sin y$	$\sinh(x \pm y) = \sinh x \cosh y \pm \cosh x \sinh y$
$\cos(x \pm y) = \cos x \cos y \mp \sin x \sin y$	$\cosh(x \pm y) = \cosh x \cosh y \pm \sinh x \sinh y$
$\tan(x \pm y) = \dfrac{\tan x \pm \tan y}{1 \mp \tan x \tan y}$	$\tanh(x \pm y) = \dfrac{\tanh x \pm \tanh y}{1 \pm \tanh x \tanh y}$
$2\sin x \cos y = \sin(x + y) + \sin(x - y)$	
$2\sin x \sin y = -\cos(x + y) + \cos(x - y)$	
$2\cos x \cos y = \cos(x + y) + \cos(x - y)$	