King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences
Semester II, 2005-2006 (052)

MATH 101 – Exam 2

NAME:_____ **ID**:_____ **Section**: _____

Part 1: Multiple Choice Questions (1 hour)

CODE 001

Question 1 (5 points)

The equation of the tangent line to the curve $y = x\sin x$ at the point $(\frac{\pi}{2}, \frac{\pi}{2})$ is

a) $y = x$

b) $y - \frac{\pi}{2} = -x + \frac{\pi}{2}$

c) $y = -x + \frac{\pi}{2}$

d) $y = x - \frac{\pi}{2}$

e) $y = x - \pi$

Question 2 (5 points)

If $g(x) + x\sin(g(x)) = x^2$ and $g(1) = 0$, then the value of $\left.\frac{dg}{dx}\right|_{x=1}$ is equal to

a) 4
b) 2
c) -1
d) 1
e) -3

Question 3 (5 points)

An equation of the line that passes through the origin and is perpendicular to the tangent line to the curve $y = x\sqrt{16 + x^2}$ at the origin would be

a) $x - 4y = 0$
b) $x + 4y = 0$
c) $y - 4x = 0$
d) $x + 16y = 0$
e) $x - 16y = 0$

Question 4 (5 points)

$\lim_{\theta \to 0} \dfrac{\tan \theta}{\theta + \sin \theta} =$

a) 0
b) $\dfrac{1}{2}$
c) Does not exist.
d) $\dfrac{3}{2}$
e) $+\infty$

Question 5 (5 points)

The derivative of $f(x) = \ln(\ln(\ln x))$ at $x = e$ is

a) $\frac{1}{e}$
b) 1
c) e
d) 0
e) not defined

Question 6 (5 points)

The diagram that describes the motion of the particle moving along a straight line (the s-axis) according to the position function $s(t) = 2t^3 - 4t^2 + 2t - 1$ is

a)

b)

c)

d)

e)

Question 7 (5 points)

If $x^4 + y^4 = a^4$ where a is a constant and x and y are variables, then $\frac{d^2y}{dx^2}$ is equal to

a) $\frac{3y^3x^2 - 3y^2x^3}{y^7}$

b) $\frac{-3x^6 - 3x^2y^4}{y^7}$

c) $-\frac{3x^2}{y^6}$

d) $\frac{-3x^2y^3 + 3x^3y^2}{y^6}$

e) $\frac{-3x^3 - 3y^4}{y^6}$

Question 8 (5 points)

If $y = \frac{(2x+1)^5(x^4-2)^6}{(1-2x^2)^7}$, then $\left.\frac{dy}{dx}\right|_{(-1,1)} =$

a) 42
b) -21
c) 0
d) 14
e) -35

Question 9 (5 points)

Let $f(x)=\tanh^{-1}(x)$ and $g(x)=\coth^{-1}(x)$. Which of the following statements is true?

a) $f'(c)=g'(c)$ for all $c\neq\pm1$.
b) $f'(c)=-g'(c)$ for all $c\neq\pm1$.
c) $f'(c)=\dfrac{1}{1-c^2}$ for all $c>1$.
d) $g'(c)=\dfrac{1}{1-c^2}$ for all $c<1$.
e) $f'(c)g'(c)$ is undefined for all c.

Question 10 (5 points)

The derivative of $y=4^{\cos\left(\frac{\pi}{2}x\right)}$ is equal to

a) $-\dfrac{\pi}{2}4^{\cos\left(\frac{\pi}{2}x\right)}(\ln 4)\sin\left(\dfrac{\pi}{2}x\right)$
b) $\dfrac{\pi}{2}4^{\cos\left(\frac{\pi}{2}x\right)}(\ln 4)\sin\left(\dfrac{\pi}{2}x\right)$
c) $4^{\cos\left(\frac{\pi}{2}x\right)}(\ln 4)\sin\left(\dfrac{\pi}{2}x\right)$
d) $-4^{\cos\left(\frac{\pi}{2}x\right)}(\ln 4)\sin\left(\dfrac{\pi}{2}x\right)$
e) $-\dfrac{\pi}{2}4^{\cos\left(\frac{\pi}{2}x\right)}(\ln 4)\cos\left(\dfrac{\pi}{2}\right)$

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Part 2: Essay Questions (1 hour)

	Score (out of 10)
Question 1	
Question 2	
Question 3	
Question 4	
Question 5	
Total (out of 50)	

Question 1

Find the derivative of $y = \dfrac{x+1}{\sqrt{(x+1)^2+1}}$.

Question 2

Differentiate $y = \sqrt{\tan^{-1} xy}$ with respect to x.

Question 3

If $y = \left(\frac{x^3 + 1}{x^4 - x} \right)\left(\frac{1}{x} - x^2 \right)$, find $\frac{dy}{dx}$.

Question 4

Find the point(s) at which the tangent to the curve of

$$f(x) = \ln\left|x^3 - 3x^2 + 3x - 1\right|$$

is parallel to the line $y - 3x - 2 = 0$.

Question 5

Where does the normal line to the curve of $x^2 - 2xy + 4y^2 = 12$ at the point $(-2,1)$ intersect the curve a second time?
(The normal line to a curve C at a point P is the line that passes through P and is perpendicular to the tangent line to C at P).