King Fahd University of Petroleum and Minerals
Department of Mathematics and Statistics

CODE 001 **Math 101** **CODE 001**

Exam 2

Term 082

Monday 18/5/2009

Net Time Allowed: 120 minutes

Name: ____

ID: ________________________ Sec: ________________________.

Check that this exam has 20 questions.

Important Instructions:

1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
2. Use HB 2.5 pencils only.
3. Use a good eraser. DO NOT use the erasers attached to the pencil.
4. Write your name, ID number and Section number on the examination paper and in the upper left corner of the answer sheet.
5. When bubbling your ID number and Section number, be sure that the bubbles match with the numbers that you write.
6. The Test Code Number is already bubbled in your answer sheet. Make sure that it is the same as that printed on your question paper.
7. When bubbling, make sure that the bubbled space is fully covered.
8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. An equation of the tangent line to the curve $y = \dfrac{x}{1 - \ln(x-1)}$ at $x = 2$ is

(a) $y = 3x - 6$

(b) $y = 3x + 7$

(c) $y = 3x - 4$

(d) $y = \frac{1}{3}x + 2$

(e) $y = -3x + 4$

2. The <u>y-intercept</u> of the tangent line to the graph of $y = \sin^{-1}\left(\dfrac{x}{2}\right)$ at $x = 1$ is

(a) $\dfrac{5\pi}{6} - \dfrac{\sqrt{3}}{3}$

(b) $\dfrac{2\pi}{3} - \sqrt{3}$

(c) $\dfrac{\pi}{3} - \sqrt{3}$

(d) $\dfrac{\pi}{6} - \dfrac{\sqrt{3}}{3}$

(e) $\dfrac{\pi}{6} - \dfrac{1}{3}$

3. If $h(x) = \dfrac{1 + xf(x)}{g(x)}$, $g(2) = 1$, $g'(2) = 3$, $f'(2) = 5$, and $h'(2) = 6$, then $f(2)$ is equal to

(a) -1

(b) $\dfrac{1}{5}$

(c) 5

(d) -5

(e) $\dfrac{2}{5}$

4. If $f(x) = (1 + x^{-1})^{-1}$, then $f'(x) =$

(a) 1

(b) $\dfrac{1}{(x+1)^2}$

(c) $-\left(\dfrac{x}{x-1}\right)^2$

(d) $\dfrac{x-1}{x}$

(e) $\dfrac{-1}{(x+1)^2}$

5. If $y\sin x = x^3 + \tan y$, then $\dfrac{dy}{dx} =$

(a) $\dfrac{y\cos x - 3x^2}{\sec^2 y - \sin x}$

(b) $\dfrac{y\sin x - 3x^2}{\sec^2 y - \sin x}$

(c) $\dfrac{3x^2}{2y\sec y^2 - \sin x}$

(d) $\dfrac{3x^2 - y\cos x}{\sec y - \sin x}$

(e) $\dfrac{3x^2}{\cos x}$

6. If $y = \sqrt[3]{x^4} - \dfrac{1}{\sqrt[4]{x^3}}$, then $\left.\dfrac{dy}{dx}\right|_{x=1} =$

(a) 0

(b) $\dfrac{7}{12}$

(c) 1

(d) $-\dfrac{3}{4}$

(e) $\dfrac{25}{12}$

7. Let $f(x) = \cot(2x)$. Using the definition of the derivative, we get $f'\left(\frac{\pi}{4}\right) =$

(a) $\lim\limits_{x\to\frac{\pi}{4}} \dfrac{4\cot(2x)}{4x-\pi}$

(b) $\lim\limits_{h\to 0} \dfrac{\cot\left(\frac{\pi}{2}+h\right)}{h-\frac{\pi}{4}}$

(c) $\lim\limits_{x\to\frac{\pi}{4}} \dfrac{\cot(2x)+1}{4x-\pi}$

(d) $\lim\limits_{h\to 0} \dfrac{\cot\left(\frac{\pi}{4}+2h\right)-2}{h}$

(e) $\lim\limits_{x\to\frac{\pi}{4}} \dfrac{\cot x-1}{x-\frac{\pi}{4}}$

8. If $y = xe^{cx}$, where c is a constant, then $y^{(4)} =$

(a) $c^3xe^{cx} + 2c^2e^{cx}$

(b) x^4e^{4cx}

(c) $c^4xe^{cx} + 4c^3e^{cx}$

(d) $4c^3xe^{cx} + c^3e^{cx}$

(e) $c^4xe^{cx} + 3c^3e^{cx}$

9. The value of the limit $\lim_{x\to 0} \dfrac{\sin x \tan(3x)}{x^3+2x^2}$

(a) is equal to $\dfrac{3}{2}$

(b) does not exist

(c) is equal to 3

(d) is equal to 0

(e) is equal to 1

10. If $f(x) = \dfrac{|x|}{\sqrt{2-x^2}}$, then $f'(-1)$

(a) does not exist

(b) is equal to -1

(c) is equal to 2

(d) is equal to -2

(e) is equal to 1

11. If $f(x) = \log_{10} \sqrt[3]{\dfrac{x^2}{(x-1)^4}}$, then $f'(2) =$

(a) $\dfrac{-\ln 10}{3}$

(b) $\dfrac{-1}{3 \ln 10}$

(c) $-2 \ln 10$

(d) $\dfrac{-1}{\ln 10}$

(e) $\dfrac{-3}{\ln 10}$

12. If $f(x) = \sqrt{x + \sqrt{3x + \sqrt{x}}}$, then $f'(1) =$

(a) $\dfrac{1}{\sqrt{3}}$

(b) $\dfrac{7}{8\sqrt{3}}$

(c) 3

(d) $\dfrac{5}{2\sqrt{3}}$

(e) $\dfrac{15}{16\sqrt{3}}$

13. The equation of motion of a particle moving in a straight line is given by

$$s(t) = t^3 - 12t + 3, \quad t \geq 0.$$

The particle is **speeding up** when

(a) $0 < t < 6$

(b) $t > 1$

(c) $1 < t < 2$

(d) $0 < t < 2$

(e) $t > 2$

14. The function $f(x) = x^3(x^2 - 2x)^5$ has horizontal tangent lines at

(a) Six points

(b) Three points

(c) Four points

(d) Five points

(e) Two points

15. The slope of the tangent line to the curve $2(x^2 + y^2)^2 = 25(x^2 - y^2)$ at the point $(3, 1)$ is

(a) $\dfrac{9}{13}$

(b) $\dfrac{-9}{13}$

(c) -3

(d) $\dfrac{6}{13}$

(e) 0

16. If the line $3x + y = b$ is tangent to the parabola $y = ax^2$ when $x = -2$, then $4a + b =$

(a) 1

(b) -2

(c) 0

(d) 3

(e) 5

17. If $y = x^{99}(x+8)$, then $\dfrac{d^{100}y}{dx^{100}} =$

(a) $99!$

(b) $99! + 8 \cdot (98!)$

(c) 0

(d) 100

(e) $100!$

18. If $\dfrac{d}{dx}[f(2x)] = x^2$, then $f'(6) =$

(a) $\dfrac{9}{2}$

(b) $\dfrac{1}{2}$

(c) 6

(d) 3

(e) 9

19. If $y = x - 2\tan^{-1}\left(\dfrac{\sin x}{1+\cos x}\right)$, then $\dfrac{dy}{dx} =$

(a) $\dfrac{1}{(1+\cos x)^2}$

(b) $\dfrac{2}{1+\cos x}$

(c) 0

(d) $\dfrac{\cos x}{1+\cos x}$

(e) 1

20. If $y = \left[\sin\left(\dfrac{1}{x}\right)\right]^x$, then $\dfrac{xy'}{y} =$

(a) $-\csc\left(\dfrac{1}{x}\right) + x\ln\left(\sin\left(\dfrac{1}{x}\right)\right)$

(b) $\dfrac{1}{x}\cot\left(\dfrac{1}{x}\right) + \ln\left(\sin\left(\dfrac{1}{x}\right)\right)$

(c) $x^2\csc\left(\dfrac{1}{x}\right) + x\ln\left(\sin\left(\dfrac{1}{x}\right)\right)$

(d) $\ln\left(\sin\left(\dfrac{1}{x}\right)\right) - \cot\left(\dfrac{1}{x}\right)$

(e) $x\ln\left(\sin\left(\dfrac{1}{x}\right)\right) - \cot\left(\dfrac{1}{x}\right)$

Q	MM	V1	V2	V3	V4
1	a	c	b	d	e
2	a	d	c	b	c
3	a	b	b	b	a
4	a	b	e	d	e
5	a	a	e	c	a
6	a	e	d	d	d
7	a	a	c	c	a
8	a	c	c	b	d
9	a	a	d	d	a
10	a	d	e	a	e
11	a	d	c	c	e
12	a	e	c	d	a
13	a	e	e	b	e
14	a	b	a	d	e
15	a	b	e	c	c
16	a	c	b	a	b
17	a	e	d	d	c
18	a	a	d	b	a
19	a	c	c	e	a
20	a	e	e	e	e