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

> Math 101 Final Exam 063 Thursday 23/8/2007

EXAM COVER

Number of versions: 4 Number of questions: 24 Number of Answers: 5 per question

This exam was prepared using mcqs For questions send an email to Dr. Ibrahim Al-Lehyani (iallehyani@kaau.edu.sa) King Fahd University of Petroleum and Minerals Department of Mathematics and Statistics

> Math 101 Final Exam 063 Thursday 23/8/2007 Net Time Allowed: 150 minutes

MASTER VERSION

1.
$$\lim_{x \to 2^+} \frac{4 - x^2}{(x - 2)^2} =$$
(a) $-\infty$
(b) ∞
(c) 4
(d) 0
(e) -4

2.
$$\lim_{x \to 0} \frac{(4+x)^{-1} - 4^{-1}}{x} =$$

(a)
$$\frac{-1}{16}$$

(b)
$$\frac{1}{16}$$

(c)
$$\frac{-1}{4}$$

$$(d) \quad 0$$

(e) does not exist

3. If
$$f(x) = \frac{x^2 + 1}{e^{3x}}$$
, then $f'(1) =$

(a)
$$\frac{-4}{e^3}$$

(b) 0
(c)
$$\frac{-4}{e^6}$$

(d)
$$\frac{2}{e^5}$$

(e)
$$\frac{8}{e^3}$$

4. The critical values of $g(t) = t^2 (2t - 5)^{1/3}$ are

(a)
$$\left\{0, \frac{5}{2}, \frac{15}{7}\right\}$$

(b) $\left\{0, \frac{15}{7}\right\}$
(c) $\left\{0, \frac{5}{2}\right\}$
(d) $\left\{\frac{5}{2}, \frac{15}{7}\right\}$
(e) $\{0\}$

Page 3 of 12

- 5. If $f(x) = 3x^{2/3} x$, then f(x) is increasing on the interval
 - (a) (0, 8)
 - (b) $(8,\infty)$
 - (c) $(-\infty, 0)$
 - (d) $(0,\infty)$
 - (e) $(-\infty, 8)$

- 6. The graph of $y = \ln(x^3 + 1)$ is concave up on the interval
 - (a) $(0, \sqrt[3]{2})$
 - (b) $(-\infty, -1)$ and $(0, \sqrt[3]{2})$
 - (c) (0, 2)
 - (d) (-1,2)
 - (e) $(0,\infty)$

7. If
$$f(x) = \begin{cases} c & \text{if } x = -3 \\ \frac{9 - x^2}{4 - \sqrt{x^2 + 7}} & \text{if } -3 < x < 3 \\ d & \text{if } x = 3 \end{cases}$$

then f is continuous on $[-3, 3]$ if

(a)
$$c = 8, d = 8$$

(b)
$$c = 8, d = -8$$

(c)
$$c = -8, d = 8$$

(d)
$$c = 0, d = 0$$

(e)
$$c = 1, d = -1$$

8. If
$$y = \left(\frac{\cos x}{1+\sin x}\right)^4$$
, then $\frac{dy}{dx} =$

(a)
$$\frac{-4\cos^3 x}{(1+\sin x)^4}$$

(b)
$$\left(\frac{-4\sin x}{\cos x}\right) \left(\frac{\cos x}{1+\sin x}\right)^3$$

(c)
$$4 \left(\frac{\cos x}{1+\sin x}\right)^3$$

(d)
$$-4 \left(\frac{\sin x}{\cos x}\right)^3$$

(e)
$$0$$

9.
$$\lim_{x \to \infty} (x - \sqrt{x^2 - 3x}) =$$

(a) $\frac{3}{2}$ (b) 3 (c) $\frac{-1}{2}$ (d) 0

(e)
$$\infty$$

10.
$$\lim_{x \to 0} \frac{|x-1| - 1}{x} =$$

- (a) -1
- (b) ∞
- (c) 0
- (d) $-\infty$
- (e) -2

Page 6 of 12

- 11. If the curve $y = ax^2 + bx + c$ passes through the point (2, 30) and is tangent to the line y = 3x at the origin, then
 - (a) a + b = 9
 - (b) a + b = 7
 - (c) a + b = 6
 - (d) a + b = 3
 - (e) a + b = 2

12. If

x	f(x)	g(x)	f'(x)	$\frac{g'(x)}{3}$	
3	1	4	8		
4	3	3	2	-5	

and $F(x) = [f(x)]^2 \cdot g(x)$, then F'(3) =

- (a) 67
- (b) 35
- (c) 48
- (d) 11
- (e) 61

- 13. The slope of normal line to the curve $x^4y^4 = 16$ at (2, 1) is
 - (a) 2
 - (b) -2
 - (c) $\frac{1}{8}$ (d) $\frac{-1}{2}$
 - (e) $\frac{1}{2}$

14. If
$$y = \sqrt[4]{\frac{(4x+1)(x+4)^2}{(x^3+9)(x^2+9)}}$$
, then $\frac{dy}{dx}\Big|_{x=0}$ is

- (a) $\frac{3}{4}$
- (b) 0
- (c) 12
- (d) $\frac{9}{2}$
- (e) $\frac{\ln 4 \ln 9}{2}$

15. If
$$f(x) = \operatorname{sech}^2(\ln(x+2))$$
, then $f'(0) =$

(a)
$$\frac{-48}{125}$$

(b) $\frac{-48}{25}$
(c) $\frac{-24}{125}$
(d) $\frac{-12}{25}$
(e) $\frac{12}{25}$

- 16. A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point (2,3), the *y*-coordinate is increasing at a rate of 4 cm/s. At this instant, the *x*-coordinate is changing at the rate of
 - (a) 2 cm/s
 - (b) 4 cm/s
 - (c) 8 cm/s
 - (d) 3 cm/s
 - (e) 6 cm/s

- 17. The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, the **relative** error in the area is
 - (a) 0.02
 - (b) 0.03
 - (c) 0.01
 - (d) 0.04
 - (e) 0.06

- 18. $f(x) = -3x^2 + 5x + 5$ is continuous on [-3, -1] and differentiable on (-3, -1). Then, the value of 'c' that satisfies the conclusion of the Mean Value Theorem is
 - (a) c = -2
 - (b) $c = \frac{-6}{5}$
 - (c) c = -1
 - (d) c = 0
 - (e) $c = \frac{-11}{6}$

Page 10 of 12

19. Given the graph of y = f'(x) i.e. the **graph of first deriv**ative of function. Then which of the following is not true?

(a)
$$f(0) > f\left(\frac{1}{2}\right)$$

(b)
$$f(4) < f(3)$$

- (c) f is concave down on (0,3)
- (d) f has critical points at x = 1 and x = 5

(e)
$$f''(3) = 0$$

20.
$$\lim_{x \to 0} (\cos x)^{1/x^2} =$$

(a)
$$\frac{1}{\sqrt{e}}$$

(b) $-\infty$
(c) 0
(d) 1

(e) e^2

21.
$$\lim_{x \to \infty} x \sin \frac{16}{x} =$$

(a) 16
(b) 0
(c) 1

- (d) $\frac{1}{16}$
- (e) ∞

22. A cylindrical can is to be made to hold $16\pi \text{ cm}^3$ of laban. If r is the radius and h is the height of the can, then the dimensions that will minimize the cost of the metal to manufacture the can are

(a)
$$r = 2, h = 4$$

(b)
$$r = \sqrt[3]{16}, h = \frac{16}{(16)^{2/3}}$$

(c)
$$r = \sqrt{\frac{8}{3}}, \ h = \frac{2}{\sqrt{3}}$$

(d)
$$r = 8, h = 16$$

(e)
$$r = 4, h = 8$$

23. Starting with $x_1 = 1$, the third approximation x_3 to the root of $x^4 - 6x + 3 = 0$ is

[Hint: use Newton's method]

- (a) $\frac{1}{2}$
- (b) 0
- (c) $\frac{59}{26}$
- (d) 2
- (e) $\frac{40}{7}$

24. A curve f(x) has a slope at each point given by $\frac{-1}{x^2}$ and passes through the point $\left(\frac{1}{8}, 10\right)$. Then

(a)
$$f(x) = \frac{1}{x} + 2$$

(b) $f(x) = \frac{-1}{x} + 14$
(c) $f(x) = \frac{3}{x^3} + 2$
(d) $f(x) = \frac{2}{x} + 2$
(e) $f(x) = \frac{2}{x^3}$

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

CODE 001

Math 101 CODE 001 Final Exam 063 Thursday 23/8/2007 Net Time Allowed: 150 minutes

Name: _____

ID: ______ Sec: _____.

Check that this exam has $\underline{24}$ 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.
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- 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. If
$$f(x) = \begin{cases} c & \text{if } x = -3 \\ \frac{9 - x^2}{4 - \sqrt{x^2 + 7}} & \text{if } -3 < x < 3 \\ d & \text{if } x = 3 \end{cases}$$
,
then f is continuous on $[-3, 3]$ if

(a)
$$c = 8, d = 8$$

(b)
$$c = -8, d = 8$$

(c)
$$c = 1, d = -1$$

(d)
$$c = 8, d = -8$$

(e)
$$c = 0, d = 0$$

2. If
$$f(x) = \frac{x^2 + 1}{e^{3x}}$$
, then $f'(1) =$

(a) 0
(b)
$$\frac{-4}{e^3}$$

(c) $\frac{-4}{e^6}$
(d) $\frac{2}{e^5}$
(e) $\frac{8}{e^3}$

- 3. The critical values of $g(t) = t^2 (2t 5)^{1/3}$ are
 - (a) $\left\{\frac{5}{2}, \frac{15}{7}\right\}$ (b) $\left\{0, \frac{5}{2}\right\}$ (c) $\left\{0, \frac{5}{2}, \frac{15}{7}\right\}$ (d) $\{0\}$ (e) $\left\{0, \frac{15}{7}\right\}$

- 4. If $f(x) = 3x^{2/3} x$, then f(x) is increasing on the interval
 - (a) $(8,\infty)$
 - (b) (0,8)
 - (c) $(0,\infty)$
 - (d) $(-\infty, 8)$
 - (e) $(-\infty, 0)$

5.
$$\lim_{x \to 0} \frac{(4+x)^{-1} - 4^{-1}}{x} =$$

- (a) $\frac{-1}{4}$
- (b) 0
- (c) does not exist

(d)
$$\frac{1}{16}$$

(e)
$$\frac{-1}{16}$$

- 6. The graph of $y = \ln(x^3 + 1)$ is concave up on the interval
 - (a) $(0,\infty)$
 - (b) $(-\infty, -1)$ and $(0, \sqrt[3]{2})$
 - (c) $(0, \sqrt[3]{2})$
 - (d) (0, 2)
 - (e) (-1,2)

7.
$$\lim_{x \to 2^+} \frac{4 - x^2}{(x - 2)^2} =$$
(a) ∞
(b) 4
(c) 0
(d) $-\infty$
(e) -4

8. If
$$y = \left(\frac{\cos x}{1+\sin x}\right)^4$$
, then $\frac{dy}{dx} =$

(a)
$$\frac{-4\cos^3 x}{(1+\sin x)^4}$$

(b)
$$\left(\frac{-4\sin x}{\cos x}\right) \left(\frac{\cos x}{1+\sin x}\right)^3$$

(c)
$$4 \left(\frac{\cos x}{1+\sin x}\right)^3$$

(d)
$$-4 \left(\frac{\sin x}{\cos x}\right)^3$$

(e)
$$0$$

9. A curve f(x) has a slope at each point given by $\frac{-1}{x^2}$ and passes through the point $\left(\frac{1}{8}, 10\right)$. Then

(a)
$$f(x) = \frac{2}{x} + 2$$

(b) $f(x) = \frac{1}{x} + 2$
(c) $f(x) = \frac{2}{x^3}$
(d) $f(x) = \frac{-1}{x} + 14$

(e)
$$f(x) = \frac{3}{x^3} + 2$$

10. The slope of normal line to the curve $x^4y^4 = 16$ at (2, 1) is

(a)
$$\frac{1}{8}$$

(b) -2
(c) $\frac{-1}{2}$
(d) 2
(e) $\frac{1}{2}$

11. If
$$f(x) = \operatorname{sech}^2(\ln(x+2))$$
, then $f'(0) =$

(a)
$$\frac{-48}{125}$$

(b) $\frac{-24}{125}$
(c) $\frac{12}{25}$
(d) $\frac{-12}{25}$
(e) $\frac{-48}{25}$

12. Given the graph of y = f'(x) i.e. the graph of first derivative of function. Then which of the following is not true?

- (a) f has critical points at x = 1 and x = 5
- (b) f(4) < f(3)
- (c) f is concave down on (0,3)

(d)
$$f(0) > f\left(\frac{1}{2}\right)$$

(e)
$$f''(3) = 0$$

13. If

x	f(x)	g(x)	f'(x)	$\frac{g'(x)}{3}$	
3	1	4	8		
4	3	3	2	-5	

and $F(x) = [f(x)]^2 \cdot g(x)$, then F'(3) =

- (a) 61
- (b) 67
- (c) 35
- (d) 48
- (e) 11

14. Starting with $x_1 = 1$, the third approximation x_3 to the root of $x^4 - 6x + 3 = 0$ is

[Hint: use Newton's method]

(a) 2 (b) $\frac{1}{2}$ (c) 0 (d) $\frac{59}{26}$ (e) $\frac{40}{7}$ 15. A cylindrical can is to be made to hold $16\pi \text{ cm}^3$ of laban. If r is the radius and h is the height of the can, then the dimensions that will minimize the cost of the metal to manufacture the can are

(a)
$$r = 8, h = 16$$

(b) $r = 2, h = 4$
(c) $r = 4, h = 8$
(d) $r = \sqrt[3]{16}, h = \frac{16}{(16)^{2/3}}$
(e) $r = \sqrt{\frac{8}{3}}, h = \frac{2}{\sqrt{3}}$

- 16. A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point (2,3), the *y*-coordinate is increasing at a rate of 4 cm/s. At this instant, the *x*-coordinate is changing at the rate of
 - (a) 3 cm/s
 - (b) 6 cm/s
 - (c) 4 cm/s
 - (d) 8 cm/s
 - (e) 2 cm/s

Page 9 of 12

- 17. If the curve $y = ax^2 + bx + c$ passes through the point (2, 30) and is tangent to the line y = 3x at the origin, then
 - (a) a + b = 9
 - (b) a + b = 2
 - (c) a + b = 3
 - (d) a + b = 7

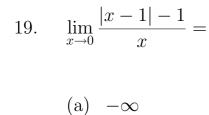
(e)
$$a + b = 6$$

18. If
$$y = \sqrt[4]{\frac{(4x+1)(x+4)^2}{(x^3+9)(x^2+9)}}$$
, then $\frac{dy}{dx}\Big|_{x=0}$ is

(a)
$$\frac{3}{4}$$

(b) 12
(c) 0
(d) $\frac{\ln 4 - \ln 9}{2}$

(e)
$$\frac{9}{2}$$



- (b) ∞
- (c) -1
- (d) -2
- (e) 0

- 20. $f(x) = -3x^2 + 5x + 5$ is continuous on [-3, -1] and differentiable on (-3, -1). Then, the value of 'c' that satisfies the conclusion of the Mean Value Theorem is
 - (a) $c = \frac{-6}{5}$
 - (b) c = -2
 - (c) c = -1
 - (d) $c = \frac{-11}{6}$
 - (e) c = 0



21. $\lim_{x \to \infty} x \sin \frac{16}{x} =$

- (a) 1
- (b) $\frac{1}{16}$
- (c) 16
- (d) 0
- (e) ∞

- 22. The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, the **relative** error in the area is
 - (a) 0.02
 - (b) 0.03
 - (c) 0.06
 - (d) 0.04
 - (e) 0.01

- (a) $\frac{1}{\sqrt{e}}$ (b) $-\infty$ (c) e^2
- (d) 1
- (e) 0

$$24. \quad \lim_{x \to \infty} (x - \sqrt{x^2 - 3x}) =$$

- (a) 0
- (b) $\frac{3}{2}$

(c)
$$\frac{-1}{2}$$

- (d) 3
- (e) ∞

Name ID

Sec

1						
	a	\mathbf{b}	с	d	е	f
2	a	b	с	d	е	f
3	a	b	с	d	е	f
4	a	b	с	d	е	f
5	a	b	с	d	е	f
6	a	b	с	d	е	f
7	a	b	с	d	е	f
8	a	b	с	d	е	f
9	a	b	с	d	е	f
10	a	b	с	d	е	f
11	a	b	с	d	е	f
12	a	b	с	d	е	f
13	a	b	с	d	е	f
14	a	b	с	d	е	f
15	a	b	с	d	е	f
16	a	b	с	d	е	f
17	a	b	с	d	е	f
18	a	b	с	d	е	f
19	a	b	с	d	е	f
20	a	b	с	d	е	f
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22	a	b	с	d	е	f
23	a	b	с	d	е	f
24	a	b	с	d	е	f
25	a	b	с	d	е	f
26	a	b	с	d	е	f
27	a	b	с	d	е	f
28	a	b	с	d	е	f
29	a	b	с	d	е	f
30	a	b	с	d	е	f
31	a	b	с	d	е	f
32	a	b	с	d	е	f
33	a	b	с	d	е	f
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34	a	b	с	d	е	f

36	a	b	с	d	е	f
37	a	b	с	d	е	f
38	а	b	с	d	е	f
39	a	b	с	d	е	f
40	a	b	с	d	е	f
41	a	b	с	d	е	f
42	a	b	с	d	е	f
43	a	b	с	d	е	f
44	a	b	с	d	е	f
45	a	b	с	d	е	f
46	a	b	с	d	е	f
47	a	b	с	d	е	f
48	a	b	с	d	е	f
49	a	b	с	d	е	f
50	a	b	с	d	е	f
51	a	b	с	d	е	f
52	a	b	с	d	е	f
53	а	b	с	d	е	f
54	a	b	с	d	е	f
55	a	b	с	d	е	f
56	a	b	с	d	е	f
57	a	b	с	d	е	f
58	a	b	с	d	е	f
59	a	b	с	d	е	f
60	a	b	с	d	е	f
61	a	b	с	d	е	f
62	a	b	с	d	е	f
63	a	b	с	d	е	f
64	a	b	с	d	е	f
65	a	b	с	d	е	f
66	a	b	с	d	е	f
67	a	b	с	d	е	f
68	a	b	с	d	е	f
69	a	b	с	d	е	f
70	a	b	с	d	е	f

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

CODE 002

Math 101 CODE 002 Final Exam 063 Thursday 23/8/2007 Net Time Allowed: 150 minutes

Name: _____

ID: ______ Sec: _____.

Check that this exam has $\underline{24}$ questions.

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- 8. When erasing a bubble, make sure that you do not leave any trace of penciling.

1. If
$$f(x) = \frac{x^2 + 1}{e^{3x}}$$
, then $f'(1) =$

(a)
$$\frac{2}{e^5}$$

(b) $\frac{-4}{e^3}$
(c) 0
(d) $\frac{-4}{e^6}$
(e) $\frac{8}{e^3}$

2. If $f(x) = 3x^{2/3} - x$, then f(x) is increasing on the interval

- (a) (0,8)
- (b) $(-\infty, 0)$
- (c) $(-\infty, 8)$
- (d) $(8,\infty)$
- (e) $(0,\infty)$



3.
$$\lim_{x \to 2^+} \frac{4 - x^2}{(x - 2)^2} =$$

(b) 0

(a) -4

- (c) ∞
- (d) $-\infty$
- (e) 4

4.
$$\lim_{x \to 0} \frac{(4+x)^{-1} - 4^{-1}}{x} =$$

(a)
$$\frac{1}{16}$$

- (b) does not exist
- (c) 0

(d)
$$\frac{-1}{16}$$

(e) $\frac{-1}{4}$

5. The critical values of $g(t) = t^2 (2t - 5)^{1/3}$ are

(a) $\left\{\frac{5}{2}, \frac{15}{7}\right\}$ (b) $\left\{0, \frac{5}{2}\right\}$ (c) $\left\{0, \frac{15}{7}\right\}$ (d) $\{0\}$

(e)
$$\left\{0, \frac{5}{2}, \frac{15}{7}\right\}$$

6. If
$$f(x) = \begin{cases} c & \text{if } x = -3 \\ \frac{9 - x^2}{4 - \sqrt{x^2 + 7}} & \text{if } -3 < x < 3 \\ d & \text{if } x = 3 \end{cases}$$
,
then f is continuous on $[-3, 3]$ if

(a) c = 8, d = 8(b) c = 8, d = -8(c) c = 0, d = 0(d) c = 1, d = -1(e) c = -8, d = 8

7. If
$$y = \left(\frac{\cos x}{1 + \sin x}\right)^4$$
, then $\frac{dy}{dx} =$

(a)
$$-4\left(\frac{\sin x}{\cos x}\right)^3$$

(b) $\left(\frac{-4\sin x}{\cos x}\right)\left(\frac{\cos x}{1+\sin x}\right)^3$
(c) 0
(d) $4\left(\frac{\cos x}{1+\sin x}\right)^3$

(e)
$$\frac{-4\cos^3 x}{(1+\sin x)^4}$$

- 8. The graph of $y = \ln(x^3 + 1)$ is concave up on the interval
 - (a) $(0,\infty)$
 - (b) (-1, 2)
 - (c) $(0, \sqrt[3]{2})$
 - (d) (0, 2)
 - (e) $(-\infty, -1)$ and $(0, \sqrt[3]{2})$

- 9. A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point (2,3), the *y*-coordinate is increasing at a rate of 4 cm/s. At this instant, the *x*-coordinate is changing at the rate of
 - (a) 6 cm/s
 - (b) 4 cm/s
 - (c) 8 cm/s
 - (d) 3 cm/s
 - (e) 2 cm/s

10.
$$\lim_{x \to 0} (\cos x)^{1/x^2} =$$

(a) $-\infty$

(b)
$$\frac{1}{\sqrt{e}}$$

- (c) e^2
- (d) 0
- (e) 1

Page 6 of 12

- 11. If the curve $y = ax^2 + bx + c$ passes through the point (2, 30) and is tangent to the line y = 3x at the origin, then
 - (a) a + b = 3
 - (b) a + b = 7
 - (c) a + b = 9
 - (d) a + b = 2

(e)
$$a + b = 6$$

12. The slope of normal line to the curve $x^4y^4 = 16$ at (2, 1) is

(a) 2 (b) $\frac{1}{8}$ (c) $\frac{-1}{2}$ (d) $\frac{1}{2}$ (e) -2



13.
$$\lim_{x \to \infty} x \sin \frac{16}{x} =$$

(a) 0

(b)
$$\frac{1}{16}$$

- (c) ∞
- (d) 1
- (e) 16

14.
$$\lim_{x \to \infty} (x - \sqrt{x^2 - 3x}) =$$

- (a) $\frac{3}{2}$
- (b) 0
- (c) ∞

(d)
$$\frac{-1}{2}$$

(e) 3

- 15. A curve f(x) has a slope at each point given by $\frac{-1}{x^2}$ and passes through the point $\left(\frac{1}{8}, 10\right)$. Then
 - (a) $f(x) = \frac{3}{x^3} + 2$ (b) $f(x) = \frac{2}{x} + 2$ (c) $f(x) = \frac{2}{x^3}$

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

(e)
$$f(x) = \frac{-1}{x} + 14$$

16. If

x	f(x)	g(x)	f'(x)	g'(x)
3	1	4	8	3
4	3	3	2	-5

and $F(x) = [f(x)]^2 \cdot g(x)$, then F'(3) =

- (a) 48
- (b) 11
- (c) 61
- (d) 67
- (e) 35

17. If
$$y = \sqrt[4]{\frac{(4x+1)(x+4)^2}{(x^3+9)(x^2+9)}}$$
, then $\frac{dy}{dx}\Big|_{x=0}$ is

(a) $\frac{\ln 4 - \ln 9}{2}$ (b) 0 (c) 12 (d) $\frac{3}{4}$ (e) $\frac{9}{2}$

18. Starting with $x_1 = 1$, the third approximation x_3 to the root of $x^4 - 6x + 3 = 0$ is

[Hint: use Newton's method]

(a) 0 (b) $\frac{1}{2}$ (c) 2 (d) $\frac{59}{26}$ (e) $\frac{40}{7}$

19. If
$$f(x) = \operatorname{sech}^2(\ln(x+2))$$
, then $f'(0) =$

(a)
$$\frac{-48}{125}$$

(b) $\frac{-24}{125}$
(c) $\frac{12}{25}$
(d) $\frac{-12}{25}$
(e) $\frac{-48}{25}$

20. A cylindrical can is to be made to hold $16\pi \text{ cm}^3$ of laban. If r is the radius and h is the height of the can, then the dimensions that will minimize the cost of the metal to manufacture the can are

(a)
$$r = 2, h = 4$$

(b) $r = 8, h = 16$
(c) $r = \sqrt{\frac{8}{3}}, h = \frac{2}{\sqrt{3}}$
(d) $r = 4, h = 8$
(e) $r = \sqrt[3]{16}, h = \frac{16}{(16)^{2/3}}$

- 21. The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, the **relative** error in the area is
 - (a) 0.06
 - (b) 0.03
 - (c) 0.04
 - (d) 0.01
 - (e) 0.02

- 22. $f(x) = -3x^2 + 5x + 5$ is continuous on [-3, -1] and differentiable on (-3, -1). Then, the value of 'c' that satisfies the conclusion of the Mean Value Theorem is
 - (a) c = 0
 - (b) $c = \frac{-11}{6}$
 - (c) c = -2
 - (d) $c = \frac{-6}{5}$
 - (e) c = -1

23. Given the graph of y = f'(x) i.e. the graph of first derivative of function. Then which of the following is not true?

(a) f has critical points at x = 1 and x = 5

(b)
$$f''(3) = 0$$

- (c) f is concave down on (0,3)
- (d) $f(0) > f\left(\frac{1}{2}\right)$

(e)
$$f(4) < f(3)$$

24.
$$\lim_{x \to 0} \frac{|x - 1| - 1}{x} =$$
(a) -2
(b) ∞
(c) $-\infty$
(d) 0
(e) -1

Name ID

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69	a	b	с	d	е	f
70	a	b	с	d	е	f
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King Fahd University of Petroleum and Minerals Department of Mathematics and Statistics

CODE 003

Math 101 CODE 003 Final Exam 063 Thursday 23/8/2007 Net Time Allowed: 150 minutes

Name: _____

ID: ______ Sec: _____.

Check that this exam has $\underline{24}$ 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.
$$\lim_{x \to 0} \frac{(4+x)^{-1} - 4^{-1}}{x} =$$

(a) does not exist

(b)
$$\frac{-1}{16}$$

(c) 0

(d)
$$\frac{1}{16}$$

(e)
$$\frac{-1}{4}$$

2. If $f(x) = 3x^{2/3} - x$, then f(x) is increasing on the interval

- (a) (0,8)
- (b) $(0,\infty)$
- (c) $(-\infty, 0)$
- (d) $(-\infty, 8)$
- (e) $(8,\infty)$

- 3. The graph of $y = \ln(x^3 + 1)$ is concave up on the interval
 - (a) $(0,\infty)$
 - (b) (-1,2)
 - (c) (0, 2)
 - (d) $(0, \sqrt[3]{2})$
 - (e) $(-\infty, -1)$ and $(0, \sqrt[3]{2})$

4. If
$$f(x) = \frac{x^2 + 1}{e^{3x}}$$
, then $f'(1) =$

(a)
$$\frac{8}{e^3}$$

(b) $\frac{2}{e^5}$
(c) $\frac{-4}{e^6}$
(d) $\frac{-4}{e^3}$
(e) 0

5. If
$$y = \left(\frac{\cos x}{1+\sin x}\right)^4$$
, then $\frac{dy}{dx} =$

(a)
$$\frac{-4\cos^3 x}{(1+\sin x)^4}$$

(b)
$$4\left(\frac{\cos x}{1+\sin x}\right)^3$$

(c)
$$-4\left(\frac{\sin x}{\cos x}\right)^3$$

(d)
$$\left(\frac{-4\sin x}{\cos x}\right)\left(\frac{\cos x}{1+\sin x}\right)^3$$

(e)
$$0$$

6.
$$\lim_{x \to 2^+} \frac{4 - x^2}{(x - 2)^2} =$$

- (a) 4
- (b) 0
- (c) -4
- (d) ∞
- (e) $-\infty$

7. If
$$f(x) = \begin{cases} c & \text{if } x = -3 \\ \frac{9 - x^2}{4 - \sqrt{x^2 + 7}} & \text{if } -3 < x < 3 \\ d & \text{if } x = 3 \end{cases}$$
,
then f is continuous on $[-3, 3]$ if

(a) c = 8, d = 8

- (b) c = 8, d = -8
- (c) c = 0, d = 0

(d)
$$c = 1, d = -1$$

(e)
$$c = -8, d = 8$$

- 8. The critical values of $g(t) = t^2 (2t 5)^{1/3}$ are
 - (a) $\left\{ 0, \frac{5}{2} \right\}$ (b) $\{0\}$
 - (c) $\left\{0, \frac{15}{7}\right\}$
 - (d) $\left\{0, \frac{5}{2}, \frac{15}{7}\right\}$
 - (e) $\left\{\frac{5}{2}, \frac{15}{7}\right\}$

9. The slope of normal line to the curve $x^4y^4 = 16$ at (2, 1) is

(a) $\frac{1}{8}$ (b) -2 (c) 2 (d) $\frac{-1}{2}$ (e) $\frac{1}{2}$

10. If
$$y = \sqrt[4]{\frac{(4x+1)(x+4)^2}{(x^3+9)(x^2+9)}}$$
, then $\frac{dy}{dx}\Big|_{x=0}$ is

(a) 12
(b)
$$\frac{\ln 4 - \ln 9}{2}$$

(c) $\frac{3}{4}$
(d) 0
(e) $\frac{9}{2}$

11. If

x	f(x)	g(x)	f'(x)	g'(x)
3	1	4	8	3
4	3	3	2	-5

and $F(x) = [f(x)]^2 \cdot g(x)$, then F'(3) =

- (a) 61
- (b) 11
- (c) 67
- (d) 48
- (e) 35

12.
$$\lim_{x \to \infty} (x - \sqrt{x^2 - 3x}) =$$

- (a) 3
- (b) 0
- (c) $\frac{-1}{2}$
- (d) ∞

(e)
$$\frac{3}{2}$$

13. If
$$f(x) = \operatorname{sech}^2(\ln(x+2))$$
, then $f'(0) =$

(a)
$$\frac{-12}{25}$$

(b) $\frac{-48}{125}$
(c) $\frac{12}{25}$
(d) $\frac{-48}{25}$
(e) $\frac{-24}{125}$

14. Given the graph of y = f'(x) i.e. the graph of first derivative of function. Then which of the following is not true?

- (a) f has critical points at x = 1 and x = 5
- (b) f is concave down on (0,3)

(c)
$$f(4) < f(3)$$

(d)
$$f(0) > f\left(\frac{1}{2}\right)$$

(e)
$$f''(3) = 0$$

15.
$$\lim_{x \to \infty} x \sin \frac{16}{x} =$$

- (a) 1
- (b) $\frac{1}{16}$
- (c) 16
- (d) 0
- (e) ∞

- 16. A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point (2,3), the *y*-coordinate is increasing at a rate of 4 cm/s. At this instant, the *x*-coordinate is changing at the rate of
 - (a) 3 cm/s
 - (b) 6 cm/s
 - (c) 2 cm/s
 - (d) 8 cm/s
 - (e) 4 cm/s

- Page 9 of 12
- 17. A cylindrical can is to be made to hold $16\pi \text{ cm}^3$ of laban. If r is the radius and h is the height of the can, then the dimensions that will minimize the cost of the metal to manufacture the can are

(a)
$$r = 8, h = 16$$

(b) $r = 2, h = 4$
(c) $r = \sqrt{\frac{8}{3}}, h = \frac{2}{\sqrt{3}}$
(d) $r = 4, h = 8$
(e) $r = \sqrt[3]{16}, h = \frac{16}{(16)^{2/3}}$

18.
$$\lim_{x \to 0} (\cos x)^{1/x^2} =$$

- (a) 1
- (b) $-\infty$
- (c) 0
- (d) e^2

(e)
$$\frac{1}{\sqrt{e}}$$

19. Starting with $x_1 = 1$, the third approximation x_3 to the root of $x^4 - 6x + 3 = 0$ is

[Hint: use Newton's method]

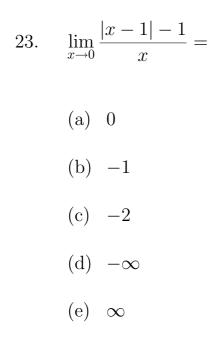
- (a) $\frac{59}{26}$
- (b) $\frac{1}{2}$
- (c) 0
- (d) $\frac{40}{7}$
- (e) 2

20. A curve f(x) has a slope at each point given by $\frac{-1}{x^2}$ and passes through the point $\left(\frac{1}{8}, 10\right)$. Then

(a) $f(x) = \frac{-1}{x} + 14$ (b) $f(x) = \frac{1}{x} + 2$ (c) $f(x) = \frac{2}{x^3}$ (d) $f(x) = \frac{2}{x} + 2$ (e) $f(x) = \frac{3}{x^3} + 2$

- 21. $f(x) = -3x^2 + 5x + 5$ is continuous on [-3, -1] and differentiable on (-3, -1). Then, the value of 'c' that satisfies the conclusion of the Mean Value Theorem is
 - (a) c = 0
 - (b) $c = \frac{-11}{6}$
 - (c) c = -2
 - (d) $c = \frac{-6}{5}$
 - (e) c = -1

- 22. The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, the **relative** error in the area is
 - (a) 0.01
 - (b) 0.06
 - (c) 0.04
 - (d) 0.03
 - (e) 0.02



- 24. If the curve $y = ax^2 + bx + c$ passes through the point (2, 30) and is tangent to the line y = 3x at the origin, then
 - (a) a + b = 6
 - (b) a + b = 9
 - (c) a + b = 7
 - (d) a + b = 3
 - (e) a + b = 2

1	a	b	с	d	е	f
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3	a	b	с	d	е	f
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68	a	b	с	d	е	f
69	a	b	с	d	е	f
70	a	b	с	d	е	f

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

CODE 004

Math 101 CODE 004 Final Exam 063 Thursday 23/8/2007 Net Time Allowed: 150 minutes

Name: _____

ID: ______ Sec: _____.

Check that this exam has $\underline{24}$ 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. If
$$f(x) = \begin{cases} c & \text{if } x = -3 \\ \frac{9 - x^2}{4 - \sqrt{x^2 + 7}} & \text{if } -3 < x < 3 \\ d & \text{if } x = 3 \end{cases}$$
,
then f is continuous on $[-3, 3]$ if

- (a) c = 8, d = 8
- (b) c = 8, d = -8
- (c) c = 0, d = 0

(d)
$$c = -8, d = 8$$

(e) c = 1, d = -1

2.
$$\lim_{x \to 0} \frac{(4+x)^{-1} - 4^{-1}}{x} =$$

(a)
$$\frac{1}{16}$$

(b) $\frac{-1}{4}$
(c) $\frac{-1}{16}$

(e) does not exist

3. If
$$y = \left(\frac{\cos x}{1+\sin x}\right)^4$$
, then $\frac{dy}{dx} =$

(a) 0
(b)
$$-4\left(\frac{\sin x}{\cos x}\right)^3$$

(c) $\left(\frac{-4\sin x}{\cos x}\right)\left(\frac{\cos x}{1+\sin x}\right)^3$
(d) $\frac{-4\cos^3 x}{(1+\sin x)^4}$
(e) $4\left(\frac{\cos x}{1+\sin x}\right)^3$

4.
$$\lim_{x \to 2^+} \frac{4 - x^2}{(x - 2)^2} =$$

- (a) ∞
- (b) 4
- (c) $-\infty$
- (d) 0
- (e) -4

5. The critical values of $g(t) = t^2 (2t - 5)^{1/3}$ are

(a) $\left\{0, \frac{15}{7}\right\}$ (b) $\left\{\frac{5}{2}, \frac{15}{7}\right\}$ (c) $\left\{0, \frac{5}{2}\right\}$ (d) $\{0\}$ (c) $\left\{-5, 15\right\}$

(e)
$$\left\{0, \frac{5}{2}, \frac{15}{7}\right\}$$

6. If
$$f(x) = 3x^{2/3} - x$$
, then $f(x)$ is increasing on the interval

- (a) $(8,\infty)$
- (b) $(0,\infty)$
- (c) (0, 8)
- (d) $(-\infty, 0)$
- (e) $(-\infty, 8)$

- 7. The graph of $y = \ln(x^3 + 1)$ is concave up on the interval
 - (a) $(-\infty, -1)$ and $(0, \sqrt[3]{2})$
 - (b) (-1,2)
 - (c) (0, 2)
 - (d) $(0,\infty)$
 - (e) $(0, \sqrt[3]{2})$

8. If
$$f(x) = \frac{x^2 + 1}{e^{3x}}$$
, then $f'(1) =$

(a) 0 (b) $\frac{-4}{e^6}$ (c) $\frac{-4}{e^3}$ (d) $\frac{8}{e^3}$ (e) $\frac{2}{e^5}$

9. If
$$y = \sqrt[4]{\frac{(4x+1)(x+4)^2}{(x^3+9)(x^2+9)}}$$
, then $\frac{dy}{dx}\Big|_{x=0}$ is

- (a) 12
- (b) $\frac{3}{4}$ (c) $\frac{9}{2}$

(d)
$$\frac{\ln 4 - \ln 9}{2}$$

$$(e) \quad 0$$

10.
$$\lim_{x \to \infty} x \sin \frac{16}{x} =$$

- (a) 0
- (b) ∞
- (c) $\frac{1}{16}$
- (d) 16
- (e) 1

11. If
$$f(x) = \operatorname{sech}^2(\ln(x+2))$$
, then $f'(0) =$

(a)
$$\frac{12}{25}$$

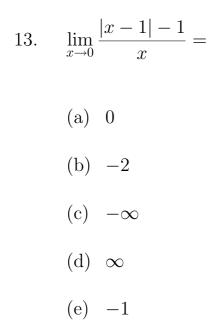
(b) $\frac{-48}{25}$
(c) $\frac{-48}{125}$
(d) $\frac{-12}{25}$
(e) $\frac{-24}{125}$

125

A cylindrical can is to be made to hold $16\pi\,\mathrm{cm}^3$ of laban. 12. If r is the radius and h is the height of the can, then the dimensions that will minimize the cost of the metal to manufacture the can are

(a)
$$r = \sqrt[3]{16}, h = \frac{16}{(16)^{2/3}}$$

(b) $r = 4, h = 8$
(c) $r = 2, h = 4$
(d) $r = 8, h = 16$
(e) $r = \sqrt{\frac{8}{3}}, h = \frac{2}{\sqrt{3}}$



14. Starting with $x_1 = 1$, the third approximation x_3 to the root of $x^4 - 6x + 3 = 0$ is

[Hint: use Newton's method]

(a) $\frac{1}{2}$ (b) $\frac{59}{26}$ (c) 2 (d) 0 (e) $\frac{40}{7}$ 15. A curve f(x) has a slope at each point given by $\frac{-1}{x^2}$ and passes through the point $\left(\frac{1}{8}, 10\right)$. Then

(a)
$$f(x) = \frac{-1}{x} + 14$$

(b) $f(x) = \frac{3}{x^3} + 2$
(c) $f(x) = \frac{2}{x} + 2$
(d) $f(x) = \frac{1}{x} + 2$
(e) $f(x) = \frac{2}{x^3}$

16. Given the graph of y = f'(x) i.e. the **graph of first deriv**ative of function. Then which of the following is not true?

- (a) f is concave down on (0,3)
- (b) f''(3) = 0
- (c) f has critical points at x = 1 and x = 5

(d)
$$f(0) > f\left(\frac{1}{2}\right)$$

(e) f(4) < f(3)

- 17. The radius of a circle is measured to be 3 m with a possible error of 0.03 m. By using differentials, the **relative** error in the area is
 - (a) 0.02
 - (b) 0.06
 - (c) 0.04
 - (d) 0.01
 - (e) 0.03

18. If

x	f(x)	g(x)	f'(x)	g'(x)
3	1	4	8	3
4	3	3	2	-5

and $F(x) = [f(x)]^2 \cdot g(x)$, then F'(3) =

- (a) 48
- (b) 11
- (c) 61
- (d) 67
- (e) 35

$$19. \quad \lim_{x \to \infty} (x - \sqrt{x^2 - 3x}) =$$

(a) $\frac{3}{2}$ (b) ∞ (c) 3 (d) 0 (e) $\frac{-1}{2}$

20. $f(x) = -3x^2 + 5x + 5$ is continuous on [-3, -1] and differentiable on (-3, -1). Then, the value of 'c' that satisfies the conclusion of the Mean Value Theorem is

(a) $c = \frac{-11}{6}$ (b) $c = \frac{-6}{5}$ (c) c = 0(d) c = -2(e) c = -1 21. The slope of normal line to the curve $x^4y^4 = 16$ at (2, 1) is

(a)
$$\frac{1}{8}$$

(b) $\frac{-1}{2}$
(c) 2
(d) $\frac{1}{2}$

(e) -2

22. If the curve $y = ax^2 + bx + c$ passes through the point (2, 30) and is tangent to the line y = 3x at the origin, then

- (a) a + b = 3
- (b) a + b = 7
- (c) a + b = 2
- (d) a + b = 6
- (e) a + b = 9

- 23. A particle moves along the curve $y = \sqrt{1 + x^3}$. As it reaches the point (2,3), the *y*-coordinate is increasing at a rate of 4 cm/s. At this instant, the *x*-coordinate is changing at the rate of
 - (a) 4 cm/s
 - (b) 6 cm/s
 - (c) 2 cm/s
 - (d) 8 cm/s
 - (e) 3 cm/s

24.
$$\lim_{x \to 0} (\cos x)^{1/x^2} =$$

(a) 0

(b)
$$\frac{1}{\sqrt{e}}$$

- (c) 1
- (d) $-\infty$
- (e) e^2

Name ID

Sec

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ANSWER KEY

1
Т

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

Answer Counts

V	a	b	с	d	е
1	8	7	5	2	2
2	4	7	4	7	2
3	7	3	2	7	5
4	2	4	5	6	7