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

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

(a) $-\infty$

(b) ∞

(c) 4

(d) 0

(e) -4

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

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

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

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

(d) 0

(e) does not exist

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

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

(b) 0

(c) $\dfrac{-4}{e^6}$

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

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

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

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

(b) $\left\{0, \dfrac{15}{7}\right\}$

(c) $\left\{0, \dfrac{5}{2}\right\}$

(d) $\left\{\dfrac{5}{2}, \dfrac{15}{7}\right\}$

(e) $\{0\}$

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

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

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

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

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

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

(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) ∞

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

(a) -1

(b) ∞

(c) 0

(d) $-\infty$

(e) -2

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

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

(a) 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 $\left.\frac{dy}{dx}\right|_{x=0}$ is

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

(b) 0

(c) 12

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

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

15. If $f(x) = \text{sech}^2(\ln(x+2))$, 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 $4\,\text{cm/s}$. 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) $c = \dfrac{-6}{5}$

(c) $c = -1$

(d) $c = 0$

(e) $c = \dfrac{-11}{6}$

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

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

Final Exam

063

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ID: ____________ Sec: ____________.

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

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

(a) 0

(b) $\dfrac{-4}{e^3}$

(c) $\dfrac{-4}{e^6}$

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

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

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

(a) ∞

(b) 4

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

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

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

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

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

(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 $f(x) = \text{sech}^2(\ln(x+2))$, then $f'(0) =$

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

(b) $\dfrac{-24}{125}$

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(d) $\dfrac{-12}{25}$

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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**?

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

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

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(a) 3 cm/s

(b) 6 cm/s

(c) 4 cm/s

(d) 8 cm/s

(e) 2 cm/s

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

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

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

(b) 12

(c) 0

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

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

19. $\lim_{x\to 0} \dfrac{|x-1|-1}{x} =$

(a) $-\infty$

(b) ∞

(c) -1

(d) -2

(e) 0

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(a) $c = \dfrac{-6}{5}$

(b) $c = -2$

(c) $c = -1$

(d) $c = \dfrac{-11}{6}$

(e) $c = 0$

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

(a) 1

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

(c) 16

(d) 0

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22. The radius of a circle is measured to be $3\,\text{m}$ with a possible error of $0.03\,\text{m}$. By using differentials, the **relative** error in the area is

(a) 0.02

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(c) 0.06

(d) 0.04

(e) 0.01

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

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

(b) $-\infty$

(c) e^2

(d) 1

(e) 0

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

(a) 0

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

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

(d) 3

(e) ∞

Name ....

ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
3	a	b	c	d	e	f
4	a	b	c	d	e	f
5	a	b	c	d	e	f
6	a	b	c	d	e	f
7	a	b	c	d	e	f
8	a	b	c	d	e	f
9	a	b	c	d	e	f
10	a	b	c	d	e	f
11	a	b	c	d	e	f
12	a	b	c	d	e	f
13	a	b	c	d	e	f
14	a	b	c	d	e	f
15	a	b	c	d	e	f
16	a	b	c	d	e	f
17	a	b	c	d	e	f
18	a	b	c	d	e	f
19	a	b	c	d	e	f
20	a	b	c	d	e	f
21	a	b	c	d	e	f
22	a	b	c	d	e	f
23	a	b	c	d	e	f
24	a	b	c	d	e	f
25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	e	f
29	a	b	c	d	e	f
30	a	b	c	d	e	f
31	a	b	c	d	e	f
32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

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

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Department of Mathematics and Statistics

CODE 002 **Math 101** **CODE 002**

Final Exam

063

Thursday 23/8/2007

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

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

(b) $\dfrac{-4}{e^3}$

(c) 0

(d) $\dfrac{-4}{e^6}$

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

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

(a) -4

(b) 0

(c) ∞

(d) $-\infty$

(e) 4

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

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

(b) does not exist

(c) 0

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

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

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

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

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

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

(c) 0

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

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

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 $4\,\text{cm/s}$. 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) $\dfrac{1}{\sqrt{e}}$

(c) e^2

(d) 0

(e) 1

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) $\frac{3}{2}$

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

(a) $f(x) = \dfrac{3}{x^3} + 2$

(b) $f(x) = \dfrac{2}{x} + 2$

(c) $f(x) = \dfrac{2}{x^3}$

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

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

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

(a) $\dfrac{\ln 4 - \ln 9}{2}$

(b) 0

(c) 12

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

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

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) $\dfrac{1}{2}$

(c) 2

(d) $\dfrac{59}{26}$

(e) $\dfrac{40}{7}$

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

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

(b) $\dfrac{-24}{125}$

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

(d) $\dfrac{-12}{25}$

(e) $\dfrac{-48}{25}$

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) $r = \sqrt{\dfrac{8}{3}},\ h = \dfrac{2}{\sqrt{3}}$

(d) $r = 4,\ h = 8$

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

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. $\lim\limits_{x \to 0} \dfrac{|x-1| - 1}{x} =$

(a) -2

(b) ∞

(c) $-\infty$

(d) 0

(e) -1

Name ....

ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
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41	a	b	c	d	e	f
42	a	b	c	d	e	f
43	a	b	c	d	e	f
44	a	b	c	d	e	f
45	a	b	c	d	e	f
46	a	b	c	d	e	f
47	a	b	c	d	e	f
48	a	b	c	d	e	f
49	a	b	c	d	e	f
50	a	b	c	d	e	f
51	a	b	c	d	e	f
52	a	b	c	d	e	f
53	a	b	c	d	e	f
54	a	b	c	d	e	f
55	a	b	c	d	e	f
56	a	b	c	d	e	f
57	a	b	c	d	e	f
58	a	b	c	d	e	f
59	a	b	c	d	e	f
60	a	b	c	d	e	f
61	a	b	c	d	e	f
62	a	b	c	d	e	f
63	a	b	c	d	e	f
64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	f

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

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

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

(c) $\dfrac{-4}{e^6}$

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

(e) 0

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

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

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

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

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

(e) 0

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

(a) 4

(b) 0

(c) -4

(d) ∞

(e) $-\infty$

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

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) $\left\{0, \dfrac{5}{2}\right\}$

(b) $\{0\}$

(c) $\left\{0, \dfrac{15}{7}\right\}$

(d) $\left\{0, \dfrac{5}{2}, \dfrac{15}{7}\right\}$

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

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 $\left.\frac{dy}{dx}\right|_{x=0}$ 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 $f(x) = \text{sech}^2(\ln(x+2))$, then $f'(0) =$

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

(b) $\dfrac{-48}{125}$

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

(d) $\dfrac{-48}{25}$

(e) $\dfrac{-24}{125}$

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

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

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

(a) 1

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

(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

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) $r = \sqrt{\dfrac{8}{3}},\ h = \dfrac{2}{\sqrt{3}}$

(d) $r = 4,\ h = 8$

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

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

(a) 1

(b) $-\infty$

(c) 0

(d) e^2

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

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) $c = \dfrac{-11}{6}$

(c) $c = -2$

(d) $c = \dfrac{-6}{5}$

(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

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

(a) 0

(b) -1

(c) -2

(d) $-\infty$

(e) ∞

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) $a + b = 2$

Name ....

ID .... Sec ....

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32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

36	a	b	c	d	e	f
37	a	b	c	d	e	f
38	a	b	c	d	e	f
39	a	b	c	d	e	f
40	a	b	c	d	e	f
41	a	b	c	d	e	f
42	a	b	c	d	e	f
43	a	b	c	d	e	f
44	a	b	c	d	e	f
45	a	b	c	d	e	f
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57	a	b	c	d	e	f
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59	a	b	c	d	e	f
60	a	b	c	d	e	f
61	a	b	c	d	e	f
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64	a	b	c	d	e	f
65	a	b	c	d	e	f
66	a	b	c	d	e	f
67	a	b	c	d	e	f
68	a	b	c	d	e	f
69	a	b	c	d	e	f
70	a	b	c	d	e	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 24 questions.

Important Instructions:

1. All types of calculators, pagers or mobile phones are NOT allowed during the examination.
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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 $f(x) = \begin{cases} c & \text{if } x = -3 \\ \dfrac{9 - x^2}{4 - \sqrt{x^2 + 7}} & \text{if } -3 < x < 3 \\ d & \text{if } x = 3 \end{cases}$,

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

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

(b) $\dfrac{-1}{4}$

(c) $\dfrac{-1}{16}$

(d) 0

(e) does not exist

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

(a) 0

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

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

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

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

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

(a) ∞

(b) 4

(c) $-\infty$

(d) 0

(e) -4

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

(a) $\left\{0, \dfrac{15}{7}\right\}$

(b) $\left\{\dfrac{5}{2}, \dfrac{15}{7}\right\}$

(c) $\left\{0, \dfrac{5}{2}\right\}$

(d) $\{0\}$

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

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

(a) 0

(b) $\dfrac{-4}{e^6}$

(c) $\dfrac{-4}{e^3}$

(d) $\dfrac{8}{e^3}$

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

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

(a) 12

(b) $\dfrac{3}{4}$

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

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

(e) 0

10. $\lim\limits_{x\to\infty} x \sin \dfrac{16}{x} =$

(a) 0

(b) ∞

(c) $\dfrac{1}{16}$

(d) 16

(e) 1

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

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

(b) $\dfrac{-48}{25}$

(c) $\dfrac{-48}{125}$

(d) $\dfrac{-12}{25}$

(e) $\dfrac{-24}{125}$

12. 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) $r = \sqrt[3]{16},\ h = \dfrac{16}{(16)^{2/3}}$

(b) $r = 4,\ h = 8$

(c) $r = 2,\ h = 4$

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

(e) $r = \sqrt{\dfrac{8}{3}},\ h = \dfrac{2}{\sqrt{3}}$

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

(a) 0

(b) -2

(c) $-\infty$

(d) ∞

(e) -1

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 $\dfrac{-1}{x^2}$ and passes through the point $\left(\dfrac{1}{8}, 10\right)$. Then

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

(b) $f(x) = \dfrac{3}{x^3} + 2$

(c) $f(x) = \dfrac{2}{x} + 2$

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

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

16. 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 is concave down on $(0, 3)$

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

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

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

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

(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 $4\,\text{cm/s}$. 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) $\dfrac{1}{\sqrt{e}}$

(c) 1

(d) $-\infty$

(e) e^2

Name ....

ID .... Sec ....

1	a	b	c	d	e	f
2	a	b	c	d	e	f
3	a	b	c	d	e	f
4	a	b	c	d	e	f
5	a	b	c	d	e	f
6	a	b	c	d	e	f
7	a	b	c	d	e	f
8	a	b	c	d	e	f
9	a	b	c	d	e	f
10	a	b	c	d	e	f
11	a	b	c	d	e	f
12	a	b	c	d	e	f
13	a	b	c	d	e	f
14	a	b	c	d	e	f
15	a	b	c	d	e	f
16	a	b	c	d	e	f
17	a	b	c	d	e	f
18	a	b	c	d	e	f
19	a	b	c	d	e	f
20	a	b	c	d	e	f
21	a	b	c	d	e	f
22	a	b	c	d	e	f
23	a	b	c	d	e	f
24	a	b	c	d	e	f
25	a	b	c	d	e	f
26	a	b	c	d	e	f
27	a	b	c	d	e	f
28	a	b	c	d	e	f
29	a	b	c	d	e	f
30	a	b	c	d	e	f
31	a	b	c	d	e	f
32	a	b	c	d	e	f
33	a	b	c	d	e	f
34	a	b	c	d	e	f
35	a	b	c	d	e	f

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

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

Answer Counts

V	a	b	c	d	e
1	8	7	5	2	2
2	4	7	4	7	2
3	7	3	2	7	5
4	2	4	5	6	7