King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

CODE 001 **Math 101** CODE 001

Math 101
Exam 3
061
Wednesday 10/1/2007
Net Time Allowed: 90 minutes

Name: ______________________________

ID: ________________ Sec: ________________.

Check that this exam has 15 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. The linearization L of the function $f(x) = \sqrt{6x+3}$ at $a = 1$ is given by

(a) $L(x) = \dfrac{7}{2} - x$

(b) $L(x) = 3 + x$

(c) $L(x) = \dfrac{5}{2} + \dfrac{1}{2}x$

(d) $L(x) = \dfrac{3}{2} + \dfrac{3}{2}x$

(e) $L(x) = 2 + x$

2. $\displaystyle\lim_{x\to 0} \frac{\cos(9x) - 1}{x^2} =$

(a) 0

(b) $\dfrac{81}{2}$

(c) $\dfrac{-81}{2}$

(d) 1

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

3. Consider the function $f(x) = x^2 + 2x + 1$ on the interval $[1, 2]$. If 'c' is the number satisfying the conclusion of the Mean Value Theorem, then $4c + 2 =$

(a) 8

(b) 1

(c) 10

(d) -1

(e) 9

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

(a) ∞

(b) 3

(c) 6

(d) 0

(e) -3

5. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. If he is 40 ft from the pole, then the tip of his shadow is moving at the rate of

(a) $5\frac{2}{3}$ ft/s

(b) $8\frac{1}{3}$ ft/s

(c) $48\frac{1}{3}$ ft/s

(d) $333\frac{1}{3}$ ft/s

(e) 9 ft/s

6. The radius of a circular disc is given as 24 cm with a maximum error in measurement of 0.2 cm. Using differentials the percentage error in the measurement of area of the disc will be

(a) $0.4\pi\,\%$

(b) $9.4\pi\,\%$

(c) $1\frac{2}{3}\,\%$

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

(e) $2\frac{1}{3}\,\%$

7. The absolute maximum of $f(x) = \sqrt[3]{x}(8 - x)$ on $[0, 8]$ is

(a) $6\sqrt[3]{2}$

(b) $5\sqrt[3]{3}$

(c) $4\sqrt[3]{4}$

(d) 7

(e) 0

8. Square corners are cut out from a thin piece of carboard of size 3 ft by 3ft, so that the sides can be folded up to make a box with open top. The largest volume that such a box can have is given by

(a) $V = 4 \text{ ft}^3$

(b) $V = 2 \text{ ft}^3$

(c) $V = 3 \text{ ft}^3$

(d) $V = 1 \text{ ft}^3$

(e) $V = 5 \text{ ft}^3$

9. $\lim_{x \to 0^+} (1 + \sin(4x))^{\cot x} =$

(a) e^{-1}

(b) e^4

(c) e^{-2}

(d) e^{-4}

(e) e

10. The first derivative test tells that the function $f(x) = \sqrt[3]{x^2 - x}$ has

(a) no local minimum and one local maximum

(b) one local minimum and no local maximum

(c) two local minima and one local maximum

(d) one local minimum and two local maxima

(e) neither local minimum nor local maximum

11. The **sum** of all critical points of the function

$$f(x) = \cos^2 x - 2\sin x$$

over the interval $0 \leq x < 2\pi$ is

(a) 2π

(b) $\frac{5\pi}{2}$

(c) $\frac{\pi}{2}$

(d) $\frac{3\pi}{2}$

(e) π

12. 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. How fast is the x-ccordinate of the point changing at that instant?

(a) $\frac{1}{4}$ cm/s

(b) 6 cm/s

(c) $\frac{2}{3}$ cm/s

(d) $\frac{1}{3}$ cm/s

(e) 2 cm/s

13. The **derivative** of $f(x)$ is given by $f'(x) = (1-x)(7-x)$. The intervals on which $f(x)$ is increasing or decreasing are

(a) decreasing on $(1, 7)$ and increasing on $(-\infty, 1) \cup (7, \infty)$

(b) decreasing on $(7, \infty)$ and increasing on $(-\infty, 1)$

(c) decreasing on $(-\infty, 1) \cup (7, \infty)$ and increasing on $(1, 7)$

(d) decreasing on $(-\infty, 1)$ and increasing on $(7, \infty)$

(e) decreasing on $(-\infty, -1) \cup (-7, \infty)$ and increasing on $(-1, -7)$

14. The **graph of the first derivative** f' of a function f is shown below. Which of the following statements is **WRONG** about f?

(a) f is concave up on $(1, 3)$, and $(8, \infty)$

(b) f is concave down on $(6, 7)$

(c) $x = 1, x = 8$ are inflection points of f

(d) f has local extrema at $x = 2$ and $x = 6$

(e) f is increasing on $(6, \infty)$ and decreasing on $(0, 2)$

15. Using the derivative tests and equations of asymptotes, the graph of the curve $xy = x^2 + 4$

(a)

(b)

(c)

(d)

(e)

King Fahd University of Petroleum and Minerals
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CODE 002 **Math 101** **CODE 002**

Exam 3

061

Wednesday 10/1/2007

Net Time Allowed: 90 minutes

Name: ______________________________

ID: ____________________ Sec: ____________________.

Check that this exam has 15 questions.

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

(a) 0

(b) 3

(c) -3

(d) 6

(e) ∞

2. Consider the function $f(x) = x^2 + 2x + 1$ on the interval $[1, 2]$. If 'c' is the number satisfying the conclusion of the Mean Value Theorem, then $4c + 2 =$

(a) 1

(b) 9

(c) 8

(d) 10

(e) -1

3. The linearization L of the function $f(x) = \sqrt{6x+3}$ at $a = 1$ is given by

(a) $L(x) = 3 + x$

(b) $L(x) = \frac{7}{2} - x$

(c) $L(x) = \frac{3}{2} + \frac{3}{2}x$

(d) $L(x) = 2 + x$

(e) $L(x) = \frac{5}{2} + \frac{1}{2}x$

4. $\lim_{x \to 0} \frac{\cos(9x) - 1}{x^2} =$

(a) 0

(b) 1

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

(d) $\frac{81}{2}$

(e) $\frac{-81}{2}$

5. The radius of a circular disc is given as 24 cm with a maximum error in measurement of 0.2 cm. Using differentials the percentage error in the measurement of area of the disc will be

(a) $9.4\pi\,\%$

(b) $2\frac{1}{3}\,\%$

(c) $\frac{1}{16}\,\%$

(d) $1\frac{2}{3}\,\%$

(e) $0.4\pi\,\%$

6. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. If he is 40 ft from the pole, then the tip of his shadow is moving at the rate of

(a) $333\frac{1}{3}$ ft/s

(b) $8\frac{1}{3}$ ft/s

(c) $5\frac{2}{3}$ ft/s

(d) $48\frac{1}{3}$ ft/s

(e) 9 ft/s

7. The first derivative test tells that the function $f(x) = \sqrt[3]{x^2 - x}$ has

(a) one local minimum and no local maximum

(b) neither local minimum nor local maximum

(c) no local minimum and one local maximum

(d) two local minima and one local maximum

(e) one local minimum and two local maxima

8. The **sum** of all critical points of the function

$$f(x) = \cos^2 x - 2\sin x$$

over the interval $0 \leq x < 2\pi$ is

(a) $\frac{\pi}{2}$

(b) 2π

(c) $\frac{5\pi}{2}$

(d) π

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

9. The **derivative** of $f(x)$ is given by $f'(x) = (1-x)(7-x)$. The intervals on which $f(x)$ is increasing or decreasing are

(a) decreasing on $(1, 7)$ and increasing on $(-\infty, 1) \cup (7, \infty)$

(b) decreasing on $(-\infty, 1)$ and increasing on $(7, \infty)$

(c) decreasing on $(7, \infty)$ and increasing on $(-\infty, 1)$

(d) decreasing on $(-\infty, -1) \cup (-7, \infty)$ and increasing on $(-1, -7)$

(e) decreasing on $(-\infty, 1) \cup (7, \infty)$ and increasing on $(1, 7)$

10. $\lim\limits_{x \to 0^+} (1 + \sin(4x))^{\cot x} =$

(a) e^{-2}

(b) e

(c) e^4

(d) e^{-4}

(e) e^{-1}

11. 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. How fast is the x-ccordinate of the point changing at that instant?

(a) 6 cm/s

(b) $\frac{1}{4}$ cm/s

(c) $\frac{1}{3}$ cm/s

(d) $\frac{2}{3}$ cm/s

(e) 2 cm/s

12. Square corners are cut out from a thin piece of carboard of size 3 ft by 3ft, so that the sides can be folded up to make a box with open top. The largest volume that such a box can have is given by

(a) $V = 3$ ft^3

(b) $V = 1$ ft^3

(c) $V = 4$ ft^3

(d) $V = 2$ ft^3

(e) $V = 5$ ft^3

13. The absolute maximum of $f(x) = \sqrt[3]{x}(8-x)$ on $[0,8]$ is

(a) $6\sqrt[3]{2}$

(b) $5\sqrt[3]{3}$

(c) 7

(d) $4\sqrt[3]{4}$

(e) 0

14. The **graph of the first derivative** f' of a function f is shown below. Which of the following statements is **WRONG** about f?

(a) f has local extrema at $x = 2$ and $x = 6$

(b) f is increasing on $(6, \infty)$ and decreasing on $(0, 2)$

(c) f is concave down on $(6, 7)$

(d) f is concave up on $(1, 3)$, and $(8, \infty)$

(e) $x = 1, x = 8$ are inflection points of f

15. Using the derivative tests and equations of asymptotes, the graph of the curve $xy = x^2 + 4$

(a)

(b)

(c)

(d)

(e)

King Fahd University of Petroleum and Minerals
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CODE 003 **Math 101** **CODE 003**

Exam 3

061

Wednesday 10/1/2007

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Name: ____

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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. Consider the function $f(x) = x^2 + 2x + 1$ on the interval $[1, 2]$. If 'c' is the number satisfying the conclusion of the Mean Value Theorem, then $4c + 2 =$

(a) 8

(b) 9

(c) -1

(d) 1

(e) 10

2. The linearization L of the function $f(x) = \sqrt{6x+3}$ at $a = 1$ is given by

(a) $L(x) = 2 + x$

(b) $L(x) = \frac{3}{2} + \frac{3}{2}x$

(c) $L(x) = 3 + x$

(d) $L(x) = \frac{7}{2} - x$

(e) $L(x) = \frac{5}{2} + \frac{1}{2}x$

3. $\lim_{x\to 0} \frac{\cos(9x) - 1}{x^2} =$

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

(b) $\frac{81}{2}$

(c) $\frac{-81}{2}$

(d) 0

(e) 1

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

(a) ∞

(b) 6

(c) -3

(d) 3

(e) 0

5. The **sum** of all critical points of the function

$$f(x) = \cos^2 x - 2\sin x$$

over the interval $0 \le x < 2\pi$ is

(a) 2π

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

(c) $\frac{3\pi}{2}$

(d) $\frac{5\pi}{2}$

(e) π

6. The radius of a circular disc is given as 24 cm with a maximum error in measurement of 0.2 cm. Using differentials the percentage error in the measurement of area of the disc will be

(a) $9.4\pi\,\%$

(b) $2\frac{1}{3}\,\%$

(c) $\frac{1}{16}\,\%$

(d) $0.4\pi\,\%$

(e) $1\frac{2}{3}\,\%$

7. The absolute maximum of $f(x) = \sqrt[3]{x}(8 - x)$ on $[0, 8]$ is

(a) $5\sqrt[3]{3}$

(b) $4\sqrt[3]{4}$

(c) 7

(d) $6\sqrt[3]{2}$

(e) 0

8. $\lim\limits_{x \to 0^+} (1 + \sin(4x))^{\cot x} =$

(a) e^{-2}

(b) e^{-4}

(c) e^{4}

(d) e

(e) e^{-1}

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. How fast is the x-ccordinate of the point changing at that instant?

(a) $\frac{1}{4}$ cm/s

(b) $\frac{1}{3}$ cm/s

(c) $\frac{2}{3}$ cm/s

(d) 2 cm/s

(e) 6 cm/s

10. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. If he is 40 ft from the pole, then the tip of his shadow is moving at the rate of

(a) $48\frac{1}{3}$ ft/s

(b) $333\frac{1}{3}$ ft/s

(c) $5\frac{2}{3}$ ft/s

(d) 9 ft/s

(e) $8\frac{1}{3}$ ft/s

11. The first derivative test tells that the function $f(x) = \sqrt[3]{x^2 - x}$ has

(a) one local minimum and two local maxima

(b) one local minimum and no local maximum

(c) neither local minimum nor local maximum

(d) two local minima and one local maximum

(e) no local minimum and one local maximum

12. The **derivative** of $f(x)$ is given by $f'(x) = (1 - x)(7 - x)$. The intervals on which $f(x)$ is increasing or decreasing are

(a) decreasing on $(7, \infty)$ and increasing on $(-\infty, 1)$

(b) decreasing on $(-\infty, -1) \cup (-7, \infty)$ and increasing on $(-1, -7)$

(c) decreasing on $(-\infty, 1)$ and increasing on $(7, \infty)$

(d) decreasing on $(1, 7)$ and increasing on $(-\infty, 1) \cup (7, \infty)$

(e) decreasing on $(-\infty, 1) \cup (7, \infty)$ and increasing on $(1, 7)$

13. Square corners are cut out from a thin piece of carboard of size 3 ft by 3ft, so that the sides can be folded up to make a box with open top. The largest volume that such a box can have is given by

(a) $V = 5 \text{ ft}^3$

(b) $V = 3 \text{ ft}^3$

(c) $V = 4 \text{ ft}^3$

(d) $V = 1 \text{ ft}^3$

(e) $V = 2 \text{ ft}^3$

14. The **graph of the first derivative** f' of a function f is shown below. Which of the following statements is **WRONG** about f?

(a) $x = 1, x = 8$ are inflection points of f

(b) f is increasing on $(6, \infty)$ and decreasing on $(0, 2)$

(c) f has local extrema at $x = 2$ and $x = 6$

(d) f is concave down on $(6, 7)$

(e) f is concave up on $(1, 3)$, and $(8, \infty)$

15. Using the derivative tests and equations of asymptotes, the graph of the curve $xy = x^2 + 4$

(a)

(b)

(c)

(d)

(e)

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

CODE 004 **Math 101** CODE 004

Exam 3

061

Wednesday 10/1/2007

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

1. $\lim_{x\to 0} \frac{\cos(9x) - 1}{x^2} =$

(a) $\frac{-81}{2}$

(b) 0

(c) 1

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

(e) $\frac{81}{2}$

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

(a) ∞

(b) 6

(c) -3

(d) 0

(e) 3

3. The linearization L of the function $f(x) = \sqrt{6x+3}$ at $a = 1$ is given by

(a) $L(x) = 2 + x$

(b) $L(x) = \frac{7}{2} - x$

(c) $L(x) = \frac{5}{2} + \frac{1}{2}x$

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

(e) $L(x) = 3 + x$

4. Consider the function $f(x) = x^2 + 2x + 1$ on the interval $[1, 2]$. If 'c' is the number satisfying the conclusion of the Mean Value Theorem, then $4c + 2 =$

(a) 1

(b) 9

(c) 10

(d) 8

(e) -1

5. A street light is mounted at the top of a 15-ft-tall pole. A man 6 ft tall walks away from the pole with a speed of 5 ft/s along a straight path. If he is 40 ft from the pole, then the tip of his shadow is moving at the rate of

(a) $48\frac{1}{3}$ ft/s

(b) $5\frac{2}{3}$ ft/s

(c) 9 ft/s

(d) $333\frac{1}{3}$ ft/s

(e) $8\frac{1}{3}$ ft/s

6. The first derivative test tells that the function $f(x) = \sqrt[3]{x^2 - x}$ has

(a) no local minimum and one local maximum

(b) neither local minimum nor local maximum

(c) one local minimum and no local maximum

(d) two local minima and one local maximum

(e) one local minimum and two local maxima

7. Square corners are cut out from a thin piece of carboard of size 3 ft by 3ft, so that the sides can be folded up to make a box with open top. The largest volume that such a box can have is given by

(a) $V = 3\text{ ft}^3$

(b) $V = 2\text{ ft}^3$

(c) $V = 5\text{ ft}^3$

(d) $V = 1\text{ ft}^3$

(e) $V = 4\text{ ft}^3$

8. $\lim_{x\to 0^+} (1+\sin(4x))^{\cot x} =$

(a) e^{-2}

(b) e^{-4}

(c) e^{4}

(d) e

(e) e^{-1}

9. The **sum** of all critical points of the function

$$f(x) = \cos^2 x - 2\sin x$$

over the interval $0 \le x < 2\pi$ is

(a) $\frac{5\pi}{2}$

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

(c) $\frac{3\pi}{2}$

(d) π

(e) 2π

10. The **derivative** of $f(x)$ is given by $f'(x) = (1 - x)(7 - x)$. The intervals on which $f(x)$ is increasing or decreasing are

(a) decreasing on $(-\infty, 1)$ and increasing on $(7, \infty)$

(b) decreasing on $(-\infty, 1) \cup (7, \infty)$ and increasing on $(1, 7)$

(c) decreasing on $(1, 7)$ and increasing on $(-\infty, 1) \cup (7, \infty)$

(d) decreasing on $(-\infty, -1) \cup (-7, \infty)$ and increasing on $(-1, -7)$

(e) decreasing on $(7, \infty)$ and increasing on $(-\infty, 1)$

11. 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. How fast is the x-ccordinate of the point changing at that instant?

(a) 6 cm/s

(b) $\frac{2}{3}$ cm/s

(c) $\frac{1}{4}$ cm/s

(d) 2 cm/s

(e) $\frac{1}{3}$ cm/s

12. The radius of a circular disc is given as 24 cm with a maximum error in measurement of 0.2 cm. Using differentials the percentage error in the measurement of area of the disc will be

(a) $0.4\pi\,\%$

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

(c) $1\frac{2}{3}\,\%$

(d) $2\frac{1}{3}\,\%$

(e) $9.4\pi\,\%$

13. The absolute maximum of $f(x) = \sqrt[3]{x}(8-x)$ on $[0, 8]$ is

(a) $5\sqrt[3]{3}$

(b) 7

(c) $4\sqrt[3]{4}$

(d) 0

(e) $6\sqrt[3]{2}$

14. The **graph of the first derivative** f' of a function f is shown below. Which of the following statements is **WRONG** about f?

(a) f is increasing on $(6, \infty)$ and decreasing on $(0, 2)$

(b) $x = 1, x = 8$ are inflection points of f

(c) f is concave up on $(1, 3)$, and $(8, \infty)$

(d) f has local extrema at $x = 2$ and $x = 6$

(e) f is concave down on $(6, 7)$

15. Using the derivative tests and equations of asymptotes, the graph of the curve $xy = x^2 + 4$

(a)

(b)

(c)

(d)

(e)

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