King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

CODE 001 | Math 101 | CODE 001

Math 101
Exam 1
061
Sunday 8/10/2006
Net Time Allowed: 90 minutes

Name: Answers and References

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.

001

1. The graph of the function $f(x) = \frac{1+x}{x^4+x^3+4x^2+4x}$ has

(a) three vertical and one horizontal asymptote

(b) four vertical and one horizontal asymptote

(c) one vertical and one horizontal asymptote

(d) one vertical and no horizontal asymptotes

(e) three vertical and no horizontal asymptotes

Section 2.6
Q 37 – Q.42

2. $$\lim_{x \to \frac{1}{2}^-} \frac{x+3}{1-3x+2x^2} =$$

(a) $-\frac{5}{6}$

(b) $\pm\infty$

(c) $-\infty$

(d) $\frac{5}{6}$

(e) ∞

Section 2.2
Q. 32

3. If the $\epsilon - \delta$ definition of limit is used to prove that $\lim_{x \to \frac{1}{4}} (5 - 3x) = \frac{17}{4}$, then the largest possible value of δ in terms of ϵ is

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

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

(c) $\frac{3\epsilon}{4}$

(d) $\frac{\epsilon}{4}$

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

Section 2.4
Q. 22

4. The y-intercept of the tangent line to the curve $f(x) = \sqrt{x}$ at $x = 4$ is

(a) $\left(0, -\frac{1}{2}\right)$

(b) $\left(0, -\frac{1}{4}\right)$

(c) $(0, 2)$

(d) $(0, 1)$

(e) $(0, 4)$

Section 2.7
Q. 8, 9

5. $\lim_{x\to 15} \dfrac{x-15}{4-\sqrt{x+1}} =$

(a) ∞

(b) -8

(c) 0

(d) $-\infty$

(e) 1

Section 2.3
Q. 21

6. The position of a particle is given by the equation of motion $s = f(t) = \frac{t}{t+1}$ where t is measured in seconds and s in meters. Then the average velocity v_{av} in the time interval $[2, 2+h]$ and the velocity v at $t = 2$ are given by

(a) $v_{av} = \dfrac{1}{18+3h}\ m/sec, \quad v = \dfrac{1}{18}\ m/sec$

(b) $v_{av} = \dfrac{2}{18+h}\ m/sec, \quad v = \dfrac{1}{9}\ m/sec$

(c) $v_{av} = \dfrac{1}{9+5h}\ m/sec, \quad v = \dfrac{1}{9} m/sec$

(d) $v_{av} = \dfrac{4+h}{6+h}\ m/sec, \quad v = \dfrac{2}{3}\ m/sec$

(e) $v_{av} = \dfrac{1}{9+3h}\ m/sec, \quad v = \dfrac{1}{9}\ m/sec$

Section ~~2.7~~, 2.8
See for example
Q. 26 of §2.8

7. For the function f whose graph is shown, which one of the following statements is true?

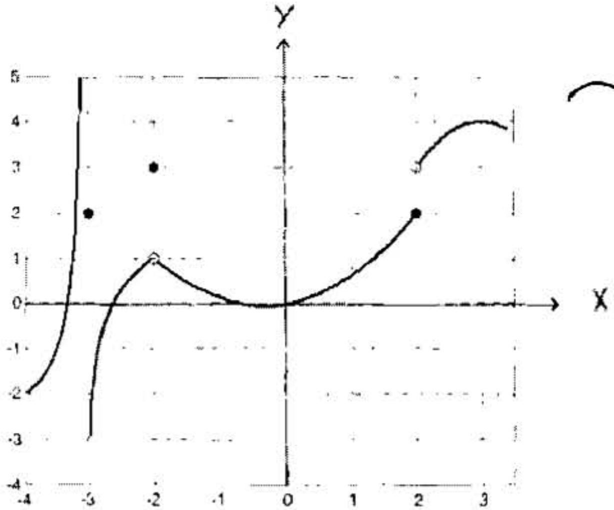
(a) $\lim_{x\to -3} f(x) = 2$

(b) $\lim_{x\to -2} f(x) = 3$

(c) $\lim_{x\to -2^-} f(x) = 1$

(d) $\lim_{x\to -3} f(x) = \infty$

(e) $\lim_{x\to 2^+} f(x) = 2$



Section 2.2
Q. 8, 9

8. The function $f(x) = \begin{cases} x & \text{if } x \le 1 \\ mx + n & \text{if } 1 < x \le 2 \\ x + 2 & \text{if } x > 2 \end{cases}$

(a) is continuous for m = 1 and n = 0

(b) is continuous for m = 0 and n = 1

(c) is continuous for all values of m and n

(d) is continuous for m = 3 and n = −2

(e) is discontinuous for all values of m and n

Section 2.5
Q. 42

9. $\lim\limits_{x\to 0}\left(\dfrac{2}{x\sqrt{4+x}} - \dfrac{1}{x}\right) =$

Section 2.3
Q.21

(a) 0

(b) $-\dfrac{5}{8}$

(c) ∞

(d) $-\infty$

(e) $-\dfrac{1}{8}$

10. Which one of the following statements is true for $\lim\limits_{x\to -\infty} f(x)$ and $\lim\limits_{x\to\infty} f(x)$ when $f(x) = \frac{\sqrt{9x^2+1}}{5-2x}$?

Section 2.6
Q.22
and
Example 4

(a) $\lim\limits_{x\to -\infty} f(x) = \lim\limits_{x\to\infty} f(x) = \dfrac{3}{2}$

(b) $\lim\limits_{x\to -\infty} f(x) = \lim\limits_{x\to\infty} f(x) = 0$

(c) $\lim\limits_{x\to -\infty} f(x) = \dfrac{3}{2}$ and $\lim\limits_{x\to\infty} f(x) = -\dfrac{3}{2}$

(d) $\lim\limits_{x\to -\infty} f(x) = -\dfrac{3}{2}$ and $\lim\limits_{x\to\infty} f(x) = \dfrac{3}{2}$

(e) $\lim\limits_{x\to -\infty} f(x) = \lim\limits_{x\to\infty} f(x) = -\dfrac{3}{2}$

11. If $\lim_{x \to 0} \frac{\sqrt{mx+n}-2}{x} = 1$, then $m+n =$

(a) 7

(b) 8

(c) 9

(d) 0

(e) 10

Section 2.2, 2.8

See for example

Q. 2. P-181

12. Which one of the following statements is true?

Section 2.2

Basic Concepts

(a) If $\lim_{x \to 2^-} f(x) = \lim_{x \to 2^+} f(x) = 5$, then $f(2) = 5$.

(b) If $\lim_{x \to 2^-} f(x) = 3$ and $\lim_{x \to 2^+} f(x) = 4$, then either $f(2) = 3$ or $f(2) = 4$.

(c) If $\lim_{x \to 2} f(x) = \infty$, then f is undefined at $x = 2$.

(d) If $\lim_{x \to 2} f(x) = 5$, then $f(2) = 5$.

(e) If $\lim_{x \to 2^-} f(x) = -\infty$ and $f(2) = 3$ then $x=2$ ~~y = 2~~ is vertical asymptote to $f(x)$

13. The limit $\lim_{x\to 0} \frac{x^2}{5} e^{\cos\left(\frac{3\pi}{2x}\right)}$

(a) is equal to 0

(b) is equal to $\frac{3\pi}{2}$

(c) does not exist

(d) is equal to $\frac{1}{5}$

(e) is equal to ∞

Section 2.3
Q. 38

14. Which one of the following functions has a removable discontinuity at $x = 1$?

(a) $f(x) = \begin{cases} \frac{x^2-1}{x-1} & \text{if } x \neq 1 \\ 2 & \text{if } x = 1 \end{cases}$

(b) $f(x) = \dfrac{1}{(x-1)^2}$

(c) $f(x) = \begin{cases} \frac{1}{x-1} & \text{if } x \neq 1 \\ 1 & \text{if } x = 1 \end{cases}$

(d) $f(x) = \begin{cases} x^2 - 1 & \text{if } x < 1 \\ 2x - 2 & \text{if } x > 1 \end{cases}$

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

Section 2.5
Q. 43
and
Example 2

15. If $f(x) = [x] + [-x]$, where $[y]$ is the greatest integer less than or equal to y, then the $\lim_{x \to 3} f(x)$

Section 2.3

Q. 51

(a) does not exist because $\lim_{x \to 3} f(x) \neq f(3)$

(b) exists and is equal to -2

(c) does not exist because $\lim_{x \to 3} [x]$ and $\lim_{x \to 3} [-x]$ do not exist

(d) exists and is equal to 0

(e) exists and is equal to -1