King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

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

Exam 1

061

Sunday 8/10/2006

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 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

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

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

   (b) $\pm\infty$

   (c) $-\infty$

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

   (e) ∞

3. If the ϵ–δ 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) $\frac{2\epsilon}{3}$

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) $(0,4)$

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

(a) ∞

(b) -8

(c) 0

(d) $-\infty$

(e) 1

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

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

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

(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

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

(a) 0

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

(c) ∞

(d) $-\infty$

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

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

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

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

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

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

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

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

(a) 7

(b) 8

(c) 9

(d) 0

(e) 10

12. Which one of the following statements is true?

(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 $y = 2$ is vertical asymptote to $f(x)$

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

(a) is equal to 0

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

(c) does not exist

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

(e) is equal to ∞

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

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

(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

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

CODE 002 **Math 101** CODE 002

Exam 1

061

Sunday 8/10/2006

Net Time Allowed: 90 minutes

Name: ______________________________

ID: ____________________ Sec: ____________________.

Check that this exam has 15 questions.

Important Instructions:

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

(a) is continuous for $\mathrm{m} = 0$ and $\mathrm{n} = 1$

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

(c) is continuous for $\mathrm{m} = 1$ and $\mathrm{n} = 0$

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

(e) is continuous for $\mathrm{m} = 3$ and $\mathrm{n} = -2$

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

(a) one vertical and no horizontal asymptotes

(b) one vertical and one horizontal asymptote

(c) three vertical and no horizontal asymptotes

(d) four vertical and one horizontal asymptote

(e) three vertical and one horizontal asymptote

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

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

(b) ∞

(c) $-\infty$

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

(e) $\pm\infty$

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

(a) $-\infty$

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

(c) ∞

(d) 0

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

5. 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) $(0, 4)$

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

(d) $(0, 2)$

(e) $(0, 1)$

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

(a) $\lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = 0$

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

(c) $\lim_{x\to-\infty} f(x) = -\frac{3}{2}$ and $\lim_{x\to\infty} f(x) = \frac{3}{2}$

(d) $\lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = -\frac{3}{2}$

(e) $\lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = \frac{3}{2}$

7. If the ϵ–δ 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) $\frac{\epsilon}{4}$

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

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

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

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

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

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

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

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

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

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

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

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

(a) -8

(b) ∞

(c) 1

(d) 0

(e) $-\infty$

11. Which one of the following statements is true?

(a) If $\lim_{x\to 2} f(x) = 5$, 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 $\lim_{x\to 2^-} f(x) = -\infty$ and $f(2) = 3$ then $y = 2$ is vertical asymptote to $f(x)$

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

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

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

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

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

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

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

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

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

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

(c) is equal to ∞

(d) does not exist

(e) is equal to 0

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

(a) exists and is equal to -1

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

(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 -2

(e) exists and is equal to 0

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

(a) 10

(b) 8

(c) 9

(d) 0

(e) 7

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

CODE 003	**Math 101**	CODE 003

Exam 1

061

Sunday 8/10/2006

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

   (a) four vertical and one horizontal asymptote

   (b) one vertical and no horizontal asymptotes

   (c) three vertical and one horizontal asymptote

   (d) three vertical and no horizontal asymptotes

   (e) one vertical and one horizontal asymptote

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

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

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

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

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

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

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

(a) $(0, 1)$

(b) $(0, 2)$

(c) $(0, 4)$

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

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

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

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

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

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

(d) $\lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = 0$

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

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

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

(b) $-\infty$

(c) $\pm\infty$

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

(e) ∞

6. $\displaystyle\lim_{x\to 0} \left(\frac{2}{x\sqrt{4+x}} - \frac{1}{x}\right) =$

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

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

(c) $-\infty$

(d) ∞

(e) 0

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

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

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

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

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

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

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

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

(c) $\dfrac{\epsilon}{3}$

(d) $\dfrac{2\epsilon}{3}$

(e) $\dfrac{3\epsilon}{4}$

9. $\displaystyle\lim_{x\to 15} \frac{x-15}{4-\sqrt{x+1}} =$

(a) 1

(b) ∞

(c) 0

(d) -8

(e) $-\infty$

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

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

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

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

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

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

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

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

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

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

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

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

12. If $\lim\limits_{x \to 0} \dfrac{\sqrt{mx+n} - 2}{x} = 1$, then $m + n =$

(a) 9

(b) 0

(c) 7

(d) 8

(e) 10

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

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

(b) does not exist

(c) is equal to 0

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

(e) is equal to ∞

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

(a) exists and is equal to -1

(b) exists and is equal to -2

(c) exists and is equal to 0

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

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

15. Which one of the following statements is true?

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

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

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

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

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

King Fahd University of Petroleum and Minerals
Department of Mathematical Sciences

CODE 004

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

CODE 004

Name: ______________________________

ID: ____________________ Sec: ____________________.

Check that this exam has 15 questions.

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

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

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

(c) $\lim_{x\to-\infty} f(x) = \frac{3}{2}$ and $\lim_{x\to\infty} f(x) = -\frac{3}{2}$

(d) $\lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = -\frac{3}{2}$

(e) $\lim_{x\to-\infty} f(x) = \lim_{x\to\infty} f(x) = \frac{3}{2}$

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

(a) ∞

(b) 1

(c) -8

(d) 0

(e) $-\infty$

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

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

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

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

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

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

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

(a) $(0, 2)$

(b) $(0, 4)$

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

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

(e) $(0, 1)$

5. 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) $\frac{2\epsilon}{3}$

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

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

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

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

6. $\lim_{x \to 0} \left(\frac{2}{x\sqrt{4+x}} - \frac{1}{x} \right) =$

(a) ∞

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

(c) $-\frac{1}{8}$

(d) 0

(e) $-\infty$

7. The function $f(x) = \begin{cases} x & \text{if } x \leq 1 \\ \mathrm{m}x + \mathrm{n} & \text{if } 1 < x \leq 2 \\ x + 2 & \text{if } x > 2 \end{cases}$

(a) is continuous for $\mathrm{m} = 3$ and $\mathrm{n} = -2$

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

(c) is continuous for $\mathrm{m} = 1$ and $\mathrm{n} = 0$

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

(e) is continuous for $\mathrm{m} = 0$ and $\mathrm{n} = 1$

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

(a) $\dfrac{5}{6}$

(b) $-\dfrac{5}{6}$

(c) ∞

(d) $-\infty$

(e) $\pm\infty$

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

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

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

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

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

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

(a) one vertical and one horizontal asymptote

(b) three vertical and one horizontal asymptote

(c) one vertical and no horizontal asymptotes

(d) three vertical and no horizontal asymptotes

(e) four vertical and one horizontal asymptote

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

(a) is equal to 0

(b) does not exist

(c) is equal to ∞

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

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

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

(a) 0

(b) 10

(c) 9

(d) 8

(e) 7

13. Which one of the following statements is true?

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

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

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

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

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

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

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

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

(c) exists and is equal to -2

(d) exists and is equal to 0

(e) exists and is equal to -1

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

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

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

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

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

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

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