1. The slope of the tangent line to the curve $y = x^2 - e^x$ at the point $(0, -1)$ is given by

(a) $\lim_{x\to 0} \dfrac{x^2 - e^x + 1}{x}$

(b) $\lim_{x\to 0} \dfrac{x^2 - e^x - 1}{x}$

(c) $\lim_{x\to 0} \dfrac{x - e^x}{x}$

(d) $\lim_{x\to 0} \dfrac{x - e^x}{x + 1}$

(e) $\lim_{x\to 0} \dfrac{x + e^x + 1}{x + 1}$

2. The vertical asymptote(s) of $f(x) = \dfrac{x^2 - x - 2}{x^2 - 4}$ is(are):

(a) $x = -2$

(b) $x = 2, \quad x = -2$

(c) $x = 2$

(d) $y = 2, \quad y = -2$

(e) $y = 2$

3. $\lim_{x\to(2\pi)^+} \ln(\sin x) =$

(a) $-\infty$

(b) ∞

(c) 0

(d) 1

(e) e

4. If $f(x) = \begin{cases} [|x|] + [|-x|] & \text{if} \quad x \leq 0 \\ x - 1 & \text{if} \quad x > 0 \end{cases}$, then $\lim_{x\to 0} f(x)$

(a) is equal to -1

(b) does not exist

(c) is equal to 2

(d) is equal to 1

(e) is equal to 0

5. Which one of the following statements is **FALSE** ?

(a) If $\lim_{x\to 0} f(x) = \infty$ and $\lim_{x\to 0} g(x) = \infty$, then $\lim_{x\to 0}(f(x) - g(x)) = 0$.

(b) A function can have two different horizontal asymptotes.

(c) If f is continuous at 5 and $f(5) = 2$, then $\lim_{x\to 2} f(4x^2 - 11) = 2$.

(d) A function can have infinitely many vertical asymptotes.

(e) If f is continuous at a, then $|f|$ is also continuous at a.

6. $\lim_{x\to 1} \dfrac{1 - \sqrt{8x - 7}}{x - 1} =$

(a) -4

(b) ∞

(c) 1

(d) -8

(e) 8

7. If $f(x) = \begin{cases} (x-b)^2 & \text{if} \quad x \geq 4 \\ \dfrac{|3-x|-1}{x-4} & \text{if} \quad x < 4 \end{cases}$ and $\lim\limits_{x \to 4} f(x)$ exists, then the value(s) of b is (are):

(a) 3 and 5

(b) 3

(c) 2

(d) -3 and 4

(e) 5

8. Let $f(x) = 1 - 4x$. The maximum value of $\delta > 0$ such that if $0 < \left|x + \dfrac{3}{2}\right| < \delta$ then $|f(x) - 7| < 0.4$ equals to:

(a) 0.1

(b) 0.4

(c) 0.2

(d) 1.6

(e) 0.8

9. The function $f(x) = \dfrac{\sqrt{x^2-4}}{x^2-1}$ is continuous on

(a) $(-\infty, -2] \cup [2, \infty)$

(b) $[-2, -1) \cup (-1, 1) \cup (1, 2]$

(c) $(-\infty, -2] \cup (-1, 1) \cup [2, \infty)$

(d) $(-\infty, -1) \cup (1, \infty)$

(e) $[-2, 2]$

10. The displacement (in centimeters) of a particle moving along a straight line is given by the equation

$$s(t) = 2 \sin \pi t + 3 \cos \pi t$$

where t is measured in seconds. The average velocity of the particle during the time period $[1, 2]$ is

(a) 6

(b) 3

(c) 2

(d) 5

(e) 0

11. The function $f(x) = \dfrac{4 + x|x|}{x + 2}$

(a) has a removable discontinuity at $x = -2$

(b) has a jump discontinuity at $x = -2$

(c) has a removable discontinuity at $x = 0$

(d) has an infinite discontinuity at $x = -2$

(e) is continuous at $x = -2$

12. If the graph of $f(x) = \dfrac{1 - e^x}{1 + 2e^x}$ has two horizontal asymptotes $y = A$ and $y = B$, then $A + B =$

(a) $\dfrac{1}{2}$

(b) $\dfrac{-1}{2}$

(c) 0

(d) 2

(e) 1

13. $\lim_{x\to 3} \dfrac{2x-6}{\dfrac{1}{x^2}-\dfrac{1}{9}} =$

(a) -27

(b) -9

(c) 9

(d) 54

(e) -3

14. $\lim_{x\to -\infty} \left[\!\left[\dfrac{1}{x}\right]\!\right]$

(a) -1

(b) 0

(c) 1

(d) does not exist

(e) 2

15. If $f(x) = \sqrt{1-4x}$, then the slope of the tangent line to the curve $y = f(x)$ at $x = a$, given that a is in the domain of $f(x)$, is equal to:

(a) $\dfrac{-2}{\sqrt{1-4a}}$

(b) $\dfrac{2}{\sqrt{1-4a}}$

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

(d) $\dfrac{-4}{\sqrt{1-4a}}$

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

16. If $f(x) = \begin{cases} x^2 \sin\dfrac{1}{x} & \text{if} \quad x \neq 0 \\ 0 & \text{if} \quad x = 0 \end{cases}$
Then $f'(0) =$

(a) 0

(b) ∞

(c) 1

(d) $-\infty$

(e) $\dfrac{1}{2}$

17. A possible formula for a function f that satisfies the following conditions: $\lim_{x\to+\infty} f(x) = 0$, $\lim_{x\to 0^+} f(x) = -\infty$, $\lim_{x\to 3^-} f(x) = \infty$, is:

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

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

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

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

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

18. If f is continuous at $x = 2$ and $\lim_{t\to 1} \dfrac{t^2 f(2t) - 2t}{t^2 - 1} = 5$, then $\lim_{x\to 2} x f(x) =$

(a) 4

(b) -1

(c) 1

(d) -2

(e) 8

19. $\lim_{x\to\infty} \tan^{-1}\left(\dfrac{x^{2.1}-x^2}{x^2+1}\right) =$

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

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

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

(d) ∞

(e) 1

20. Suppose f is continuous on $[2,6]$ and the **only** solutions of the equation $f(x) = 7$ are $x = 2$ and $x = 5$. If $f(3) = 9$, then

(a) $f(4)$ **must** be greater than 7

(b) $f(4)$ **must** be less than 7

(c) $f(4)$ **must** be greater than 9

(d) $f(4)$ **must** be less than 9

(e) $f(4)$ **must** be greater than 8

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