1. Which of the following is continuous at $x = 0$?

$$\begin{array}{ll} \text{I.} & f(x) = |x| \\ \text{II.} & f(x) = e^x \\ \text{III.} & f(x) = \ln(e^x - 1) \end{array}$$

A) I only

B) II only

C) I and II only

D) II and III only

E) none of these

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2. The graph of a function f is reflected across the x-axis and then shifted up 2 units. Which of the following describes this transformation on f ?

A) $-f(x)$

B) $f(x) + 2$

C) $-f(x + 2)$

D) $-f(x - 2)$

E) $-f(x) + 2$

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3. Which of the following functions is *not* continuous for all real numbers x ?

A) $f(x) = x^{1/3}$

B) $f(x) = \dfrac{2}{(x + 1)^4}$

C) $f(x) = |x + 1|$

D) $f(x) = \sqrt{1 + e^x}$

E) $f(x) = \dfrac{x - 3}{x^2 + 9}$

4. $\lim\limits_{x \to 1} \dfrac{\ln x}{x}$ is

  A) 1

  B) 0

  C) e

  D) $-e$

  E) nonexistent

5. $\lim\limits_{x \to 0} \left(\dfrac{1}{x} + \dfrac{1}{x^2} \right) =$

  A) 0

  B) $\frac{1}{2}$

  C) 1

  D) 2

  E) ∞

6. $\lim\limits_{x \to \infty} \dfrac{x^3 - 4x + 1}{2x^3 - 5} =$

  A) $-\frac{1}{5}$

  B) $\frac{1}{2}$

  C) $\frac{2}{3}$

  D) 1

  E) Does not exist

7. For what value of k does $\displaystyle\lim_{x \to 4} \frac{x^2 - x + k}{x - 4}$ exist?

  A) -12

  B) -4

  C) 3

  D) 7

  E) No such value exists.

8. $\displaystyle\lim_{x \to 0} \frac{\tan x}{x} =$

  A) -1

  B) $-\frac{1}{2}$

  C) 0

  D) $\frac{1}{2}$

  E) 1

9. Suppose f is defined as

$$f(x) = \begin{cases} \dfrac{|x| - 2}{x - 2} & x \neq 2 \\ k & x = 2. \end{cases}$$

Then the value of k for which $f(x)$ is continuous for all real values of x is $k =$

  A) -2

  B) -1

  C) 0

  D) 1

  E) 2

10. The average rate of change of $f(x) = x^3$ over the interval $[a, b]$ is

A) $3b + 3a$

B) $b^2 + ab + a^2$

C) $\dfrac{b^2 + a^2}{2}$

D) $\dfrac{b^3 - a^3}{2}$

E) $\dfrac{b^4 - a^4}{4(b - a)}$

11. The function
$$G(x) = \begin{cases} x - 5 & x > 2 \\ -5 & x = 2 \\ 5x - 13 & x < 2 \end{cases}$$
is not continuous at $x = 2$ because

A) $G(2)$ is not defined.

B) $\lim\limits_{x \to 2} G(x)$ does not exist.

C) $\lim\limits_{x \to 2} G(x) \neq G(2)$.

D) $G(2) \neq -5$.

E) None of the above

12. $\lim\limits_{x \to -2} \dfrac{\sqrt{2x + 5} - 1}{x + 2} =$

A) 1

B) 0

C) ∞

D) $-\infty$

E) does not exist

13. The Intermediate Value Theorem states that given a continuous function f defined on the closed interval $[a, b]$ for which 0 is between $f(a)$ and $f(b)$, there exists a point c between a and b such that

    A) $c = a - b$

    B) $f(a) = f(b)$

    C) $f(c) = 0$

    D) $f(0) = c$

    E) $c = 0$

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14. The function $t(x) = 2^x - \dfrac{|x - 3|}{x - 3}$ has

    A) a removable discontinuity at $x = 3$.

    B) an infinite discontinuity at $x = 3$.

    C) a jump discontinuity at $x = 3$.

    D) no discontinuities.

    E) a removable discontinuity at $x = 0$ and an infinite discontinuity at $x = 3$.

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15. Find the values of c so that the function

$$h(x) = \begin{cases} c^2 - x^2 & x < 2 \\ x + c & x \geq 2 \end{cases}$$

is continuous everywhere.

    A) $-3, -2$

    B) $2, 3$

    C) $-2, 3$

    D) $-3, 2$

    E) There are no such values.