CLEP College Algebra
Practice Test

Time—90 Minutes
60 Questions

For each question below, choose the best answer from the choices given.

1. \((3x + 5)^2 =\)
   (A) \(9x^2 + 30x + 25\)
   (B) \(9x^2 + 15x + 25\)
   (C) \(9x^2 + 15\)
   (D) \(9x^2 + 25\)
   (E) \(3x^2 + 25\)

2. Which of the following is a factor of \(16 – (3x + 2)^2?\)
   (A) \(16 – 3x + 2\)
   (B) \(4 + 3x – 2\)
   (C) \(4 + (3x + 2)\)
   (D) \(-(3x + 2)^2\)
   (E) \(3x + 2\)

3. \(4r(2r^2 – 6) – (5r^3 – 12 + 10r) + 8 =\)
   (A) \(3r^3 + 34r + 20\)
   (B) \(3r^3 + 34r – 20\)
   (C) \(3r^3 – 34r + 20\)
   (D) \(3r^3 – 34r – 20\)
   (E) \(13r^3 + 34r + 20\)

4. If \(a + b = 4,\) what is the value of \(|4 – a| + |4 – b|?\)
   (A) \(-4\)
   (B) \(0\)
   (C) \(4\)
   (D) \(8\)
   (E) It cannot be determined from the given information.

5. \(\frac{x^2 - 16}{x+5} \)
   (A) \(\frac{1}{(x+5)(x-5)}\)
   (B) \(\frac{(x-4)(x-5)}{x+5}\)
   (C) \(\frac{(x+4)(x-5)}{x+5}\)
   (D) \(\frac{x^2 - x - 20}{x+5}\)
   (E) \(\frac{x+5}{x-5}\)

6. Which of the following is a factor of \(8x^2 – 2x – 28?\)
   (A) \(4x + 7\)
   (B) \(4x – 4\)
   (C) \(4x + 2\)
   (D) \(2x – 7\)
   (E) \(x + 2\)

7. Of the following, which is greatest?
   (A) \(4e^2\)
   (B) \((4e)^3\)
   (C) \((2e)^3\)
   (D) \(2^{4e}\)
   (E) \((3e)^2\)
8. For every positive integer $x$, \[ \frac{x!}{(x-1)!} + x = \]

(A) $-1$

(B) $0$

(C) $x - 1$

(D) $x$

(E) $2x$

9. Which of the following is equal to $a^\frac{3}{10} b^\frac{1}{5} (\frac{a}{b})^\frac{3}{5}$?

(A) $-b^\frac{12}{5} a^\frac{7}{5}$

(B) $\frac{b^{\frac{10}{5}}}{a^{\frac{7}{5}}}$

(C) $\frac{a^{\frac{9}{10}}}{b^{\frac{7}{5}}}$

(D) $\frac{b^7}{a}$

(E) $\frac{1}{a^{\frac{5}{10}} b^{\frac{3}{5}}}$

10. Millie drops a tennis ball out a window that is $h$ feet high. The tennis ball hits the ground and bounces several times. The height of each bounce is $\frac{3}{5}$ the height of the previous bounce. For example, after the first bounce, the ball bounces to a height of $\frac{3}{5} h$ feet. Which of the following represents the total number of feet the ball travels between the first and eighth bounce?

(A) \[ \sum_{i=1}^{\infty} \frac{3}{5} h^i \]

(B) \[ \sum_{i=1}^{7} \left( \frac{3}{5} h^i \right) \]

(C) \[ \sum_{i=1}^{8} \left( \frac{3}{5} h^i \right) \]

(D) \[ \sum_{i=1}^{8} \left( \frac{3}{5} h^{i+1} \right) \]

(E) \[ \sum_{i=1}^{10} \left( \frac{3}{5} h^{i+1} \right) \]
11. Which of the lines in the figure above is the graph of \( y = -5 \)?

(A) \( a \)
(B) \( b \)
(C) \( c \)
(D) \( d \)
(E) \( e \)

12. Which of the following gives all values of \( p \) for which \(|p + 8| \geq 12|)?

(A) \( \{p \mid p \geq 12\} \)
(B) \( \{p \mid 4 \leq p \leq 20\} \)
(C) \( \{p \mid -12 \leq p \leq 12\} \)
(D) \( \{p \mid -20 \leq p \leq 4\} \)
(E) \( \{p \mid p \leq -20 \text{ or } p \geq 4\} \)

13. Which of the following are the solutions of the equation \( 3x^2 - x = x - 16 \)?

(A) \( x = 3 \) and \( x = 16 \)
(B) \( x = 16 \) and \( x = -8 \)
(C) \( \frac{2 + 2\sqrt{47}}{6} \) and \( \frac{2 - 2\sqrt{47}}{6} \)
(D) \( \frac{-2 + 2\sqrt{47}}{3} \) and \( \frac{-2 - 2\sqrt{47}}{3} \)
(E) \( \frac{2 + 2\sqrt{47}}{6} \) and \( \frac{2 - 2\sqrt{47}}{6} \)

14. The shaded region in the figure above represents the intersection of the graphs of \( y \geq x \), \( x \geq 1 \), and which of the following inequalities?

(A) \( y \leq 2x + 3 \)
(B) \( y \geq 2x + 3 \)
(C) \( y \leq 2x - 3 \)
(D) \( y \geq 4x - 3 \)
(E) \( y \geq 4x + 3 \)
15. The figure above shows the graph of the line with equation $ax - by = 1$. Which of the following must be true?

(A) $a = 1$ and $b < 0$
(B) $a < 0$ and $b = 0$
(C) $a < 0$ and $b < 0$
(D) $a < 0$ and $b > 0$
(E) $a > 0$ and $b < 0$

16. The set of all values for $b$ for which the equation $5x^2 + bx + 5 = 0$ has either one or two real roots is defined by

(A) $b < 10$
(B) $b > 10$
(C) $b \leq -5$ or $b \geq 5$
(D) $b \leq -10$ or $b \geq 10$
(E) $b < -10$ or $b > 10$

17. Which quadrants of the $xy$-plane contain points of the graph of $5x + y < 6$?

(A) II and IV only
(B) I, II, and IV only
(C) II, III, and IV only
(D) I, II, and III only
(E) I, II, III, and IV

18. Janna opens a bank account with $5,000 and makes no additional deposits or withdrawals. During the same week, her friend Emily spends $15,000 on a new car. At the end of each year, $250 is added to Janna’s account, while the value of Emily’s car decreases by $500 each year. Which of the following systems of equations could be used to find the number of years, $y$, that it will take for the values of Janna’s bank account ($v_1$) and Emily’s car ($v_2$) to be equal?

(A) $v_1 = 5,000 + y$ and $v_2 = 15,000 - y$
(B) $v_1 = 5,000y + 250$ and $v_2 = 15,000y - 500$
(C) $v_1 = 5,000 + 250y$ and $v_2 = 15,000 - 500y$
(D) $v_1 = 5,000 + 500y$ and $v_2 = 15,000 - 250y$
(E) $v_1 = 5,000 - 250y$ and $v_2 = 15,000 + 500y$

19. If $A = \{50, 65\}$, $B = \{45, 50, 60, 75\}$, and $C = \{30, 40, 50, 60, 70\}$, then $(A \cup B) \cap C$

(A) the empty set
(B) $\{50\}$
(C) $\{60\}$
(D) $\{50, 60\}$
(E) $\{45, 50, 60, 65, 70\}$

20. Which of the following numbers are not rational?

I. $i$
II. $\sqrt{2}$
III. $\frac{3}{4}$

(A) I only
(B) I and II only
(C) I and III only
(D) II and III only
(E) I, II, and III
21. When \( \frac{2 - 6i}{2 - i} \) is expressed in the form \( a + bi \), then what is the value of \( b \)?

22. If \( l > m > 0 > n \), then each of the following must be true EXCEPT

(A) \( ln < lm \)
(B) \( lm > mn \)
(C) \( ln < m^2 < lm \)
(D) \( l^4 > m^4 > n^4 \)
(E) \( \sqrt{l} > \sqrt{m} \)

23. \((\sqrt{3}i)^5 = \)

(A) \(-9\sqrt{3}\)
(B) \(9\sqrt{3}i\)
(C) \(27i\)
(D) \(9\)
(E) \(-\sqrt{3}i\)

24. What are all real values of \( y \) for which

\[
\frac{5}{y + 7} = \frac{1}{5} + \frac{y}{10}
\]

(A) \( y = -12 \)
(B) \( y = 3 \) and \( y = -3 \)
(C) \( y = 3 \) and \( y = -12 \)
(D) \( y = 12 \) and \( y = -12 \)
(E) There are no real solutions.

25. What is the 20th term of the arithmetic sequence \( 3x, 3x + 2, 3x + 4, \ldots \)?

(A) \( x + 38 \)
(B) \( 3x + 38 \)
(C) \( 3x + 40 \)
(D) \( 3x + 42 \)
(E) \( 114 \)

26. The table above gives some of the values of a fifth degree polynomial \( p(r) \). Based on the values shown, what is the minimum number of real roots of the equation \( p(r) = 0 \)?

(A) Five
(B) Four
(C) Three
(D) Two
(E) One

27. Monica drew a pattern with rows of triangles. The last row had 35 triangles. The row above it had 33 triangles, and each row above had 2 fewer triangles than the row just below it. There is 1 triangle in the top row. How many triangles are in the pattern in all?
28. What is the middle term in the expansion of \( \left( \frac{x}{3} + 2x \right)^6 \)?

(A) \( \frac{20}{27} \)

(B) \( \frac{160}{27} \)

(C) \( \frac{20x^5}{27} \)

(D) \( \frac{160x^4}{27} \)

(E) \( \frac{80x^5}{3} \)

29. If \( x = 5 \) is a solution to the equation \( 2x^3 - ax^2 + 4x - 20 = 0 \), what is the value of \( a \)?

30. The first three terms of a geometric sequence are \( \frac{1}{5}, -\frac{1}{15}, \) and \( \frac{1}{45} \). Which of the following represents the \( n \)th term of the sequence?

(A) \( \frac{(-1)^{n-1}}{5(3)^{n-2}} \)

(B) \( \frac{(-1)^n}{5(3)^n} \)

(C) \( \frac{(-1)^{n+1}}{15^{n-1}} \)

(D) \( \frac{(-1)^{n+1}}{15^{n-1}} \)

(E) \( \frac{(-1)^n}{5(3)^{n-2}} \)

31. If the remainder is 19 when \( x^3 - 2x^2 + lx - 8 \) is divided by \( x - 3 \), then \( l = \)

(A) 0

(B) 3

(C) 5

(D) 6

(E) 9

32. The figure above shows the graph of the function \( f \). What is the value of \( f(f(0)) \)?

(A) 1

(B) 2

(C) 3

(D) 4

(E) 5

33. In the \( xy \)-plane, what is the \( x \)-intercept of the graph of \( y = \frac{3}{5}x - 15 \)?
34. Which of the following define \( y \) as a function of \( x \)?

I.  

II. \( 6x^2 + 4y = 15 \)

III.  

<table>
<thead>
<tr>
<th>( x )</th>
<th>( y )</th>
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<tbody>
<tr>
<td>-10</td>
<td>8</td>
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<tr>
<td>-5</td>
<td>-7</td>
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<tr>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>-7</td>
</tr>
</tbody>
</table>

(A) None  
(B) I only  
(C) I and II only  
(D) II and III only  
(E) I, II, and III

35. If \( 5^{2+p} = 25^p \), then \( p = \) 

36. Which of the following could be the graph of \( y = x^2 + 8x + 12 \)?

(A)  
(B)  
(C)  
(D)  
(E)
37. If \( f(x) = 4x - 3 \) and \( g(x) = 3x + 3 \), then \( f(g(x)) = \)
(A) \( 12x^2 + 3x - 9 \)
(B) \( 12x + 9 \)
(C) \( 12x + 15 \)
(D) \( x + 3 \)
(E) \( 7x \)

38. If \( \log_2(x - 6) = 5 \), then what is the value of \( x \)?
(A) 25
(B) 31
(C) 38
(D) 41
(E) 59

39. For a science experiment, Ajay starts with 8 milliliters of a solution at 9:00 A.M. Every 20 minutes, he doubles the amount of solution. Assuming no solution evaporates, how many milliliters of solution will there be at 11:00 A.M.?
(A) 256
(B) 512
(C) 1,024
(D) 2,048
(E) 4,096

40. Which of the following must be true?
   I. \( \ln 12.5^x = x \ln 12.5 \)
   II. \( \log_p(p^r) = x \log_p p + \log_p r \)
   III. \( \log_x 4^x = 4^x \)
   (A) I only
   (B) II only
   (C) I and II only
   (D) II and III only
   (E) I, II, and III

41. If \( f(x) = 8 + 3x^2 \), and \( f^{-1} \) represents the inverse function of \( f \), then \( f^{-1}(x) = \)
(A) \( 3 + 8x^2 \)
(B) \( \frac{1}{8 + 3x^2} \)
(C) \( \sqrt{\frac{8-x}{3}} \)
(D) \( \sqrt{\frac{x-8}{3}} \)
(E) \( \sqrt{\frac{x-8}{3}} \)

42. \( \frac{3x - 2}{x + 4} - \frac{x - 5}{3x + 2} \)
(A) \( \frac{8x^2 - 6x - 24}{(x + 4)(3x + 2)} \)
(B) \( \frac{8x^2 + x + 16}{(x + 4)(3x + 2)} \)
(C) \( \frac{2x - 7}{(x + 4)(3x + 2)} \)
(D) \( \frac{x + 5}{(x + 4)(3x + 2)} \)
(E) \( \frac{2x + 3}{-2x - 2} \)
43. The graph of the function \( y = f(x) \) is shown in the preceding diagram. Which of the following is the graph of \( y = f(x - 2) + 2 \)?

(A) ![Graph A]

(B) ![Graph B]

(C) ![Graph C]

(D) ![Graph D]

(E) ![Graph E]

44. \((i - 4)(2 + i) + (3i - 6) = \)

(A) \(-15 + i\)

(B) \(-14 + i\)

(C) \(-12 + i\)

(D) \(-21\)

(E) \(-3\)

45. \( f \) is an exponential function defined by \( f(x) = mn^x \), where \( m \) and \( n \) are positive constants. If \( f(4) = 162 \) and \( f(3) = 54 \), what is the value of \( m \)?

46. Which of the following will result in a perfect square for all integer values of \( x \), when added to \( 9x^2 + 16 \)?

(A) \(36x\)

(B) \(24x\)

(C) \(16x\)

(D) \(12x\)

(E) \(0\)

\[ x + y = 2 \]
\[ x^2 + y^2 = 52 \]

47. For what values of \( x \) will \((x, y)\) be a solution to the above system of equations?

(A) The system has no solutions.

(B) \( x = -6 \) and \( x = 4 \)

(C) \( x = 6 \) and \( x = -4 \)

(D) \( x = 2 \) and \( x = 2 \)

(E) \( x = 7 \) and \( x = \sqrt{3} \)
48. Which of the points in the above figure represents the complex number $-1 + 4i$?

(A) A  
(B) B  
(C) C  
(D) D  
(E) E

49. What is the ending value of an investment if $7,000 is invested at 3% compounded monthly for 4 years? Round your answer to the nearest dollar.

50. For the function $f(x) = \log_5 x$, which of the following must be true?

I. $f(x)$ decreases with decreasing values of $x$  
II. The domain is $(-\infty, 0)$  
III. The range is $(-\infty, \infty)$  

(A) I only  
(B) I and II only  
(C) II and III only  
(D) I and III only  
(E) I, II, and III

51. $3x(4x^2 + 2) - (8 - 2x^3 + 10x) - 4 = $

(A) $10x^3 - 4x - 4$  
(B) $14x^3 + 4x + 4$  
(C) $14x^3 - 4x + 12$  
(D) $14x^3 - 4x - 12$  
(E) $14x^3 + 16x - 12$

52. If $A = \left\{ \frac{1}{4}, \frac{2}{5} \right\}$, $B = \left\{ \frac{1}{4}, \frac{3}{5}, \frac{4}{7} \right\}$, and $C = \left\{ \frac{1}{2}, \frac{1}{4}, \frac{3}{4} \right\}$, then $(A \cup B) \cap C$ is

(A) $\left\{ \frac{1}{4} \right\}$  
(B) $\left\{ \frac{1}{2} \right\}$  
(C) $\left\{ \frac{1}{2}, \frac{3}{4} \right\}$  
(D) $\left\{ \frac{1}{4}, \frac{3}{5}, \frac{4}{7} \right\}$  
(E) the empty set

53. Which of the following numbers are rational?

I. $\sqrt{5}$  
II. $\pi$  
III. $6.8989…$

(A) I only  
(B) III only  
(C) I and III only  
(D) II and III only  
(E) I, II, and III
54. The first three terms of a geometric sequence are 15, 7.5, and 3.75. Which of the following represents the $n$th term of the sequence?

(A) $15(2^{n-1})$
(B) $15(0.5^{n-1})$
(C) $\frac{15}{0.5^{n-1}}$
(D) $15(-0.5^{n-1})$
(E) $\frac{-15}{2^{n-1}}$

55. If $a + 5 = b$, what is the value of $|a - b| - |b - a|$?

(A) $-10$
(B) $-5$
(C) $0$
(D) $5$
(E) It cannot be determined from the given information.

56. Which of the points in the preceding figure represents the complex number $-3 - 2i$?

(A) $A$
(B) $B$
(C) $C$
(D) $D$
(E) $E$

57. The first three terms in an arithmetic sequence are $\frac{x}{2} + 5$, $\frac{x}{2} + 12$, and $\frac{x}{2} + 19$. What is the 15th term in the sequence?

(A) $x + 50$
(B) $\frac{x}{2} + 96$
(C) $\frac{x}{2} + 98$
(D) $\frac{x}{2} + 103$
(E) $\frac{x}{2} + 110$
58. The table above gives some values of a 5th degree polynomial \( f(x) \). Based on the values in the table, what is the minimum number of real roots of the equation \( f(x) = 0 \)?

(A) Five
(B) Four
(C) Three
(D) Two
(E) One

59. Which of the following numbers are real?

I. \( i^2 \)
II. \( \sqrt{i} \)
III. \( 2i \)

(A) I only
(B) II only
(C) III only
(D) I and II only
(E) I, II, and III

60. \(-5b(b^2 + 2b) - (4 + 3b^3 - 6b) + 7 =

(A) \(-8b^3 - 10b^2 + 6b + 3\)
(B) \(8b^3 + 10b^2 - 6b - 3\)
(C) \(-8b^3 - 10b^2 + 3\)
(D) \(2b^3 - 10b^2 + 6b + 3\)
(E) \(2b^3 - 10b^2 + 3\)