

EST II

MATH - LEVEL 1

Date:

Test Center:

Room Number:

Student's Name:

National ID:

EST ID:

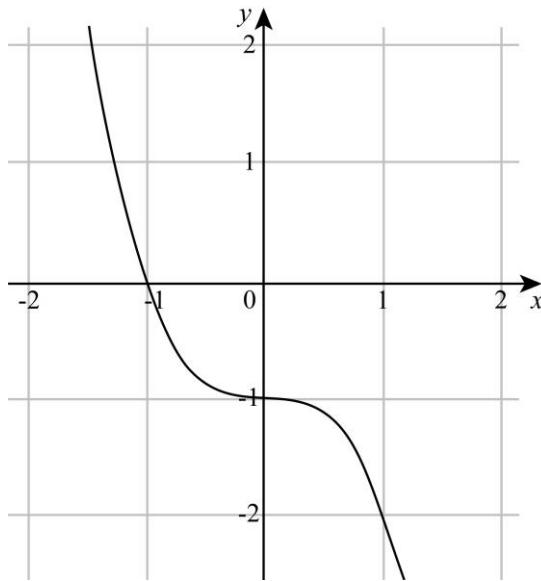
Duration: 60 minutes

40 Multiple Choice Questions

Instructions:

- Place your answers on the answer sheet. Mark only one answer for each of the multiple-choice questions.
- Avoid guessing. Your answers should reflect your overall understanding of the subject matter.
- Graphing and scientific calculators are allowed.



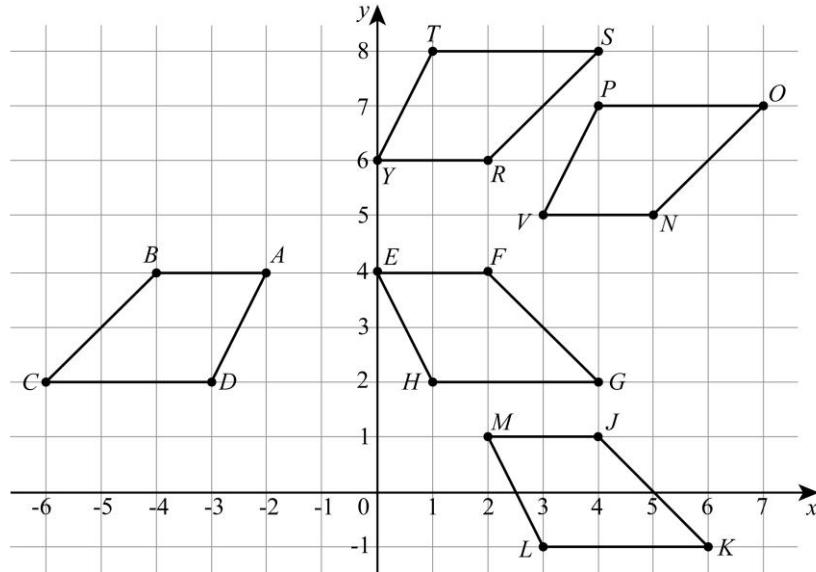


1. Which of the following statements can be true regarding the polynomial function P represented in the graph above?
 - A. -1 is a root of P .
 - B. The constant term of P is positive.
 - C. The degree of the function is 2 .
 - D. The function P is increasing over \mathbb{R} .
 - E. The value of P at zero is equal to the value of P at -1 .

2. The graph of a function g cuts the x -axis two times and has a positive y -intercept. Which of the following could be the equation of $g(x)$?
 - A. $g(x) = x(x + 7)(x + 6)$
 - B. $g(x) = (x^2 - 3)(2x + 7)(3x - 1)$
 - C. $g(x) = (x^2 + 2)(x - 1)(x - 14)$
 - D. $g(x) = 2(x + 1)(x + 2)(x + 3)$
 - E. $g(x) = 4(x - 2)(x - 1)(x - 3)$

3. What is the probability that a randomly formed six-letter word using all the letters of the word EUROPE has the two E's next to each other?
 - A. $\frac{1}{4}$
 - B. $\frac{1}{3}$
 - C. $\frac{1}{2}$
 - D. $\frac{3}{5}$
 - E. $\frac{3}{4}$

4. $2 \cos(x) \times (-10 \cos(x)) - (-4 \sin(x)) \times (-5 \sin(x)) =$
- A. -20
B. -2
C. 1
D. 20
E. None of the above
5. A geometric sequence has a first term equal to 16 and a sixth term equal to 121.5. What is the value of the square of the common ratio?
- A. 1.0
B. 1.50
C. 2.0
D. 2.25
E. 4.0
6. If the ratio of x to y is equal to 2 and the ratio of y to z is equal to 1, which of the following must be true?
- A. $x = \frac{1}{z}$
B. $x = z$
C. $x = 3z$
D. $y = 2z$
E. $z = \frac{x}{2}$
7. The supplement of an angle T is $(3x + 5)^\circ$ and the vertically opposite angle to T measures $(x - 15)^\circ$. What is the value of x ?
- A. $x = 42.5$
B. $x = 44.5$
C. $x = 45.5$
D. $x = 46.5$
E. $x = 47.5$



8. Amin drew the polygon $ABCD$ shown above. Ismail drew the four polygons to the right, all congruent to $ABCD$. The lengths of all drawn segments are equal to:
- $\sqrt{5} + 2\sqrt{2} + 5$ units
 - $5\sqrt{5} + 2\sqrt{2} + 25$ units
 - $6\sqrt{5} + 12\sqrt{2} + 30$ units
 - $5\sqrt{5} + 10\sqrt{2} + 25$ units
 - $4\sqrt{5} + 8\sqrt{2} + 20$ units
9. What is the distance between the vertex of $y = 2x^2 + 4x - 1$ and the point of coordinates $(9, 7)$?
- $5\sqrt{2}$
 - $10\sqrt{2}$
 - $20\sqrt{2}$
 - 30
 - 31
10. If $625^{3x} \cdot 10^6 = 5^{24} \cdot 2^y$, then $\frac{y}{x} =$
- 1
 - 2
 - 3
 - 4
 - 6

11. Given line d with equation $2(x - 3y) + x = 1$, what is the equation of the line parallel to d and passing through point $M(1, -3)$?

A. $y = \frac{1}{2}x - 7$

B. $y = \frac{1}{2}x + 7$

C. $y = x - 7$

D. $2y = x - 7$

E. $2y = x + 7$

3, 7, 9, 2, 11, 13, 14

12. What is the product of the range and the median of the set above?

A. 9

B. 21

C. 100

D. 108

E. 200

13. In a basketball game, a team of 8 players scored a total of 122 points. What was the average number of points scored per player?

A. 13.65

B. 14.50

C. 14.75

D. 15.20

E. 15.25

14. $ABFD$ is a parallelogram with base $AB = 5\text{ m}$ and a height of 2 m . Let M be the midpoint of segment \overline{DF} and T the symmetric point of B with respect to M . What is the area of triangle DTM ?

A. 20.0 m^2

B. 10.0 m^2

C. 7.5 m^2

D. 5.0 m^2

E. 2.5 m^2

15. The area of a rectangle is 44 m^2 . The length of this rectangle is 2.5 m more than its width. What is the perimeter, rounded to the nearest tenth, of the triangle formed by two adjacent sides of this rectangle and one of its diagonals?

A. 16.6

B. 23.2

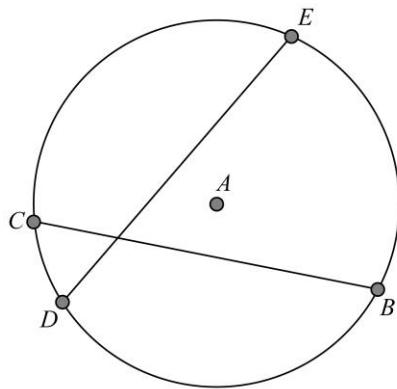
C. 33.2

D. 66.5

E. 83.1

16. What is/are the root(s) of $\frac{x^2 + 4x - 77}{x^2 - x - 42}$?

- A. $x = -11$ only
- B. $x = 6$ only
- C. $x = 7$ only
- D. $x = -6$ and $x = 11$
- E. $x = 11$ and $x = -11$



17. In the figure above, \overline{BC} and \overline{DE} intersect at M . If $CM = 4.0\text{ cm}$, $DM = 4.5\text{ cm}$, and $ME = 8.0\text{ cm}$, what is the length of \overline{MB} ? (Figure not drawn to scale)

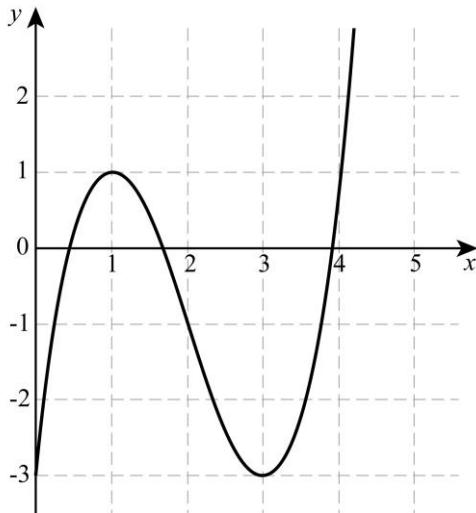
- A. 0.1 cm
- B. 2.3 cm
- C. 5.0 cm
- D. 7.1 cm
- E. 9.0 cm

18. Given $y = 3x^2 + 7x + c$, where c is a real number. Which of the following statements is/are true?

- I. The product of the roots of the equation is positive if $c > 0$.
 - II. If $c > \frac{49}{12}$, then the equation has two real solutions.
 - III. If $c < \frac{49}{12}$, then the sum of the roots of the equation is $-\frac{7}{3}$.
- A. I only
 - B. II only
 - C. I and II only
 - D. I and III only
 - E. II and III only

$$7x^2 + 3(x - 5) + 2 = 7(x^2 + 7x - 4)$$

19. The solution of the equation above is $\frac{k}{46}$, where k is a constant. What is the value of k^2 ?
- A. 225
B. 260
C. 365
D. 370
E. 400
20. Six friends want to sit on a bench that can fit all six of them. Alice wants to sit at the edge of the bench. In how many possible ways can the six friends sit?
- A. 120
B. 240
C. 420
D. 720
E. 1,440



21. The figure above shows the graph of a function f . The function g is defined as $g(x) = 1 - f(x)$. Which of the following is the maximum value of $g(x)$ over $[0, 4]$?
- A. -3
B. 0
C. 1
D. 3
E. 4

22. Three interior angles of a convex hexagon have measures x° , $(2x + 12)^\circ$, and $(3x - 8)^\circ$. The other three angles are congruent, each with an exterior angle measuring $(x - 7)^\circ$. If the value of x can be expressed as $\frac{m}{3}$, where m is a constant, what is the value of m ?

- A. 120
- B. 155
- C. 240
- D. 310
- E. 930

23. Consider the parabola P with the equation $y = -3x^2 + 12$. Which of the following has the same y -intercept as P and only one x -intercept in common with P ?

- A. $y = -6x^2 + 12$
- B. $y = -3(x - 2.5)^2 + 2$
- C. $y = -3x + 12$
- D. $y = x^2 + x + 12$
- E. $y = 2(x - 2.5)^2 - 0.5$

$$\begin{cases} x + 2y = 5 \\ 4x + by = c \end{cases}$$

24. The system of equations above, where b and c are two constants, has infinitely many solutions. What is the value of $b + c$?

- A. 8
- B. 20
- C. 21
- D. 28
- E. 42

25. Consider a line l that passes through points $A(5, -3)$ and $B(-1, 4)$. What is the slope of the line perpendicular to l ?

- A. $-\frac{7}{6}$
- B. $-\frac{6}{7}$
- C. $\frac{5}{7}$
- D. $\frac{6}{7}$
- E. $\frac{8}{7}$

26. What is the value of $\frac{8^{2x}}{128^y}$ if $12x - 14y = 3$?

- A. -1
- B. $2\sqrt{2}$
- C. $4\sqrt{2}$
- D. 6
- E. 8

27. Given a circle C with center K and radius 15 cm , if \overline{AB} is a diameter of C and M is a point on C , what is the value of $MA^2 + MB^2 - MK^2$?

- A. 225
- B. 675
- C. 685
- D. 775
- E. $1,125$

28. Which of the following represents the expression of the n -th term of the arithmetic sequence $3, 11, 19, 27, \dots$?

- A. $a_n = n^8 - 5$
- B. $a_n = n + 5$
- C. $a_n = 8n - 5$
- D. $a_n = 8n$
- E. $a_n = 8n + 5$

29. If $\frac{2}{3x-1} = -\frac{3}{4}$, what is the value of $9x + 1$?

- A. -6
- B. -4
- C. $\frac{4}{9}$
- D. 4
- E. 6

30. What is the measure of each angle in a regular octagon?

- A. 180°
- B. 160°
- C. 150°
- D. 135°
- E. 120°

31. In a simple game of dice, three fair dice are rolled. The player wins if all three dice show either even numbers or odd numbers. A player rolled the three dice for two rounds. What is the probability that the player loses in the first round but wins in the second round?

A. $\frac{3}{16}$

B. $\frac{1}{4}$

C. $\frac{3}{4}$

D. $\frac{15}{16}$

E. 1

32. A construction company is laying tiles in a new mall. It was observed that 8 workers can tile 120 square meters in 6 hours. Assuming all workers work at the same rate, how many square meters can 10 workers tile in 9 hours?

A. 180

B. 200

C. 225

D. 240

E. 250

33. The triangle ABC is right angled at B . If $5 \sin(A) = \cos(A)$, then which of the following is equal to $\sin(C)$?

A. $\frac{AB}{5AC}$

B. $\frac{AC}{AB}$

C. $\frac{BC}{AC}$

D. $5\frac{AC}{BC}$

E. $5\frac{BC}{AC}$

34. Given a circle C with center O and a point A outside the circle such that $AO = 8 \text{ cm}$, if the radius of the circle is 4 cm , what is the measure of the angle between \overline{AO} and the tangent drawn from A to C ?

A. 20°

B. 25°

C. 30°

D. 60°

E. 90°

35. If $ABMN$ is a parallelogram such that $m\angle ABM = 40^\circ$ and $m\angle NMB = (3x - 13)^\circ$, what is the value of x ?

- A. 49
- B. 51
- C. 53
- D. 55
- E. 57

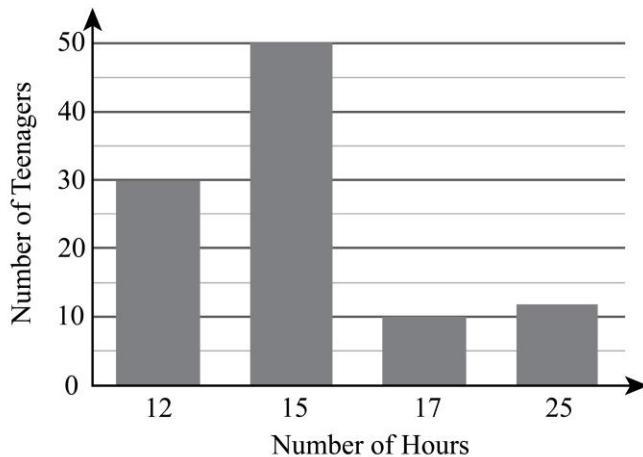
$$|2x - 12| > |x| + 1$$

36. Which of the following is the interval notation representing the solution set of the inequality above?

- A. $(-\infty, \frac{11}{3}] \cup [\frac{4}{3}, +\infty)$
- B. $(-\infty, \frac{11}{3}) \cup (13, +\infty)$
- C. $(-\infty, \frac{4}{3}] \cup [13, +\infty)$
- D. $(-\infty, \frac{3}{4}) \cup (18, +\infty)$
- E. $(-\infty, 0) \cup (\frac{4}{3}, +\infty)$

37. Given the inequality $6(x + 2y) < 2x - 3(y - 1)$, which of the following points does not belong to its set of solutions?

- A. $(-17, 2)$
- B. $(-8, 3)$
- C. $(0, 0)$
- D. $(2, -1)$
- E. $(3, -1)$



38. The graph above shows the number of hours per week teenagers spend playing video games in a certain neighborhood. Approximately, what is the average number of hours spent by one teenager?
- A. 13.0
 - B. 14.5
 - C. 15.5
 - D. 20.0
 - E. 30.0
39. Consider the triangle ABC , isosceles at A with $m\angle ACB = 50^\circ$, and \overline{AM} is the median drawn from A to \overline{BC} . If D and E are respectively the symmetric points of C and M with respect to A , what is the measure of $\angle DAE$?
- A. 25°
 - B. 40°
 - C. 45°
 - D. 50°
 - E. 80°
40. Among the following, for which value(s) of b does the equation $3x^2 + bx + 3 = 0$ have two distinct real solutions?
- I. -14
 - II. 5
 - III. 12
- A. I only
 - B. I and II only
 - C. I and III only
 - D. II and III only
 - E. I, II, and III