Select the letter of the most appropriate answer and shade in the corresponding region on the answer sheet. Choice "None" represents "None of these".

1. Find the exact distance between the points, (2, 1) and (5, 7), in the plane.

    A) $\sqrt{51}$ B) $3\sqrt{5}$ C) 9   D) $2\sqrt{7}$ E) None

2. Find the midpoint of the line segment joining the points (-5, -3) and (9, 3).

    A) (4, 0)   B) (14, 6)   C) (-14, -6)   D) (2, 0)   E) None

3. Find the x-intercept of the graph of $y = x^3 - 4x$.

    A) (0, 0), (2, 0), (-2, 0)   B) (4, 0), (-1, 0), (-2, 0)   C) (0, 0), (1, 0), (-1, 0)
    D) (2, 0), (1, 0), (1, 0)   E) None

4. Find the y-intercept of the graph of $y = x^3 - 4x$.

    A) (0, 4)   B) (0, -4)   C) (0, 0)   D) (0, 2)   E) None

5. The point (3, 4) lies on a circle whose center is at (-1, 2). Write the standard form of the equation of the circle.

    A) $x^2 + y^2 = 16$ B) $(x - 3)^2 + (x - 4)^2 = 12$ C) $(x + 1)^2 + (y - 2)^2 = 20$
    D) $x^2 + y^2 = 30$ E) None

6. Find the slope of the line passing through (3, 4) and (3, 1).

    A) 3   B) 4   C) 1   D) No Slope   E) None

7. Find the slope-intercept form of the equation of the line that passes through the point (2, -1) that is parallel to $2x - 3y = 5$.

    A) $y = \dfrac{2}{3}x - \dfrac{7}{3}$ B) $y = \dfrac{1}{2}x + \dfrac{2}{3}$ C) $y = \dfrac{3}{4}x - 2$ D) $y = 2x + 2$ E) None

8. Find the slope-intercept form of the equation of the line that passes through the point (2, -1) that is perpendicular to $2x - 3y = 5$.

    A) $y = -\dfrac{3}{2}x + 2$ B) $y = 2x - \dfrac{2}{3}$ C) $y = 3x - 1$ D) $y = \dfrac{3}{2}x - 2$ E) None

9. Find the zeros of the function $f(x) = \dfrac{2t-3}{t+5}$.

    A) $\dfrac{1}{2}$ B) $\dfrac{3}{2}$ C) -5   D) 3   E) None

10. Find the exact minimum value of the function $f(x) = 3x^2 - 4x - 2$.

    A) 4   B) -2   C $-\dfrac{10}{3}$ D) $-\dfrac{5}{3}$ E) None

11. Find the average rate of change of $f(x) = x^3 - 3x$ from $x_1 = -2$ to $x_2 = 0$.

    A) 2   B) 1   C) 0   D) -2   E) None

12. Write the linear function f for which $f(1) = 3$ and $f(4) = 0$.

    A) f(x) = x − 4   B) f(x) = x + 4   C) f(x) = -x + 4   D) f(x) = 4x + 1   E) None

13. Find (fg)(x) given $f(x) = x^2$ and g(x) = x − 3.

    A) $x^3 - 3x^2$ B) $x^2 - x + 3$ C) $x^2 - 6x + 9$ D) $x^3 - x^2 - 3x$ E) None

14. Find (f ∘ g)(x) given f(x) = x + 2 and $g(x) = 4 - x^2$.

    A) $x^2 - 6$ B) $6 + x - x^2$ C) $8 + 4x - 2x^2$ D) $-x^2 + 6$ E) None

15. Find the inverse function of the function $f(x) = \frac{5}{x-2}$.

A) $\frac{2}{5} + x$ B) $\frac{5}{x} + 2$ C) $\frac{1}{2}x + 5$ D) $5x - \frac{1}{5}$ E) None

16. Write the standard form of the equation of the parabola whose vertex is (1, 2) and that passes through the point (3, -6).
A) $f(x) = -2(x - 2)^2 + 2$ B) $f(x) = 2(x + 2)^2 + 2$ C) $f(x) = -2(x - 1)^2 + 2$
D) $f(x) = 2(x + 1)^2 + 1$ E) None

17. Find the maximum height (in feet, rounded to three decimal places) of a baseball that has a path given by the function $h(x) = -0.0032x^2 + x + 3$.
A) 79.525   B) 83.215   C) 81.125   D) 80.725   E) None

18. Approximate the real zero of $f(x) = x^3 - x^2 + 1$ to three decimal places.
A) -0.500   B) -0.255   C) -0.555   D) -0.755   E) None

19. Divide $x^3 - 1$ by $x - 1$.
A) $x^2 - x - 1$ B) $x^2 + x + 1$ C) $x^2 - x + 1$ D) $x^2 + x - 1$ E) None

20. Multiply the complex number, 4 – 3i, by its complex conjugate.
A) 25   B) 12   C) 7   D) 5   E) None

21. Find the rational zeros of $f(x) = 2x^3 + 3x^2 - 8x + 3$.
A) {2, 3, -8}   B) {3, -8, 3}   C) {1, ½, -3}   D) {2, ½, -8}   E) None

22. Solve $x^2 - x - 6 < 0$.
A) -6<x<1   B) -2<x<3   C) -2<x<6   D) 1<x<6   E) None

23. Solve $\frac{2x-7}{x-5} \le 3$.
A) (-∞, 5) U [8, ∞)   B) (-∞, -7) U [3, ∞)   C) (-∞, 3) U [8, ∞)
D) (-∞, 2) U [7, ∞)   E) None

24. Solve for x, $9 = 3^{x+1}$.
A) 3   B) 9   C) -1   D) 1   E) None

25. Solve for x, $e^{-3x-4} = e^{-x^2}$.
A) 4   B) -3   C) -3/4   D) 2   E) None

26. Solve for x exactly, $2 \log_5 (3x) = 4$.
A) 3   B) 5   C) 2   D) 4/3   E) None

27. Convert 135° to exact radians.
A) 2π/3   B) π/3   C) 3π/4   D) π/2   E) None

28. A circle has radius 4 inches. Find the exact length of the arc intercepted by a central angle of 240°.
A) 10π/3   B) 11π/4   C) 15π/4   D) 16π/3   E) None

29. Let Θ be an acute angle such that sin Θ = 0.6. Find the value of cos Θ.
A) 0.6   B) -0.6   C) -0.5   D) 0.8   E) None

30. A surveyor is standing 115 feet from the base of the Washington Monument. The survey or measures the angle of elevation to the top of the monument as 78.3°. Find the height of the monument, rounded to whole feet.
   A) 215   B) 555   C) 445   D) 335   E) None

31. A right triangle has an 18.4° angle opposite a leg which measures 4 feet. Find the length in feet of the hypotenuse, rounded to one decimal place.
   A) 12.7   B) 10.5   C) 11.2   D) 11.8   E) None

32. Determine the number of subsets of set K = { 4, 5, 6, 7}.
   A) 8   B) 9   C) 16   D) 4   E) None

33. Simplify: $\dfrac{4+\sqrt{3}}{2-3\sqrt{3}}$

   A) $\dfrac{-17-11\sqrt{3}}{23}$ B) $\dfrac{-17-14\sqrt{3}}{23}$ C) $\dfrac{-17-10\sqrt{3}}{23}$ D) $\dfrac{-17-15\sqrt{3}}{23}$ E) None

34. Change $0.\overline{63}$ into a fraction in simplest form.
   A) 4/11   B) 5/11   C) 6/11   D) 7/11   E) None

35. Find the length in feet of a rectangular box with surface area of 94 square feet with a width of 4 feet and a height of 3 feet.
   A) 5   B) 6   C) 5.5   D) 6.1   E) None

36. Simplify (write your answer with rational exponents): $\sqrt{x^3 y}\,\sqrt[4]{xy^3}$
   A) $x^{3/4}y^{3/4}$ B) $x^{5/4}y^{3/4}$ C) $x^{7/4}y^{5/4}$ D) $x^{3/4}y^{5/4}$ E) None

37. Find the sum of $\begin{bmatrix} 6 & 3 \\ 9 & 15 \end{bmatrix}$ and $\begin{bmatrix} 4 & 7 \\ 1 & 0 \end{bmatrix}$.

   A) $\begin{bmatrix} 10 & 10 \\ 10 & 15 \end{bmatrix}$.   B) $\begin{bmatrix} 2 & 4 \\ 8 & 0 \end{bmatrix}$.   C) $\begin{bmatrix} 2 & 4 \\ 8 & 15 \end{bmatrix}$.   D) $\begin{bmatrix} 10 & 7 \\ 8 & 10 \end{bmatrix}$.   E) None

38. What is the smallest number that is divisible by 3 and 5 and leaves a remainder of 3 when divided by 7?
   A) 33   B) 18   C) 28   D) 45   E) None

39. How many different ways can the digits 3, 5, 7, and 8 be arranged in order if no repetition of digits is allowed?
   A) 4   B) 12   C) 24   D) 36   E) None

40. If a horse has won three of its last ten races, what are the odds that it will win its next race?
   A) 3:7   B) 7:10   C) 3:7   D) 3:4   E) None