1. Find the domain of the function, $f(x) = \dfrac{\sqrt{x^2-1}}{x+5}$.

    (A) $(-\infty, -1] \cup [1, \infty)$ (B) $(-\infty, -1) \cup (1, \infty)$ (C) $(-\infty, 5) \cup (5, \infty)$

    (D) $(-\infty, -5) \cup (-5, \infty)$ (E) $(-\infty, -5) \cup (-5, -1] \cup [1, \infty)$

2. Find the domain of the function, $f(x) = \dfrac{\cos x}{\sqrt{x^2+3x+2}}$.

    (A) $(-\infty, -2] \cup [-1, \infty)$ (B) $(-\infty, -2) \cup (-1, \infty)$ (C) $(-2, -1)$

    (D) $(-\infty, \infty)$ (E) $(-\infty, -2) \cup (-2, -1) \cup (-1, \infty)$

3. Find the slope of the curve, $f(x) = 3x^2 + 4e^{5x-3}$, at x = 3.

    (A) $18 + 4e^{12}$ (B) $18 + 20e^{12}$ (C) $9 + 20e^{12}$

    (D) $9 + 20e^{5}$ (E) answer not given

4. Solve for x: $\ln(x-2) + \ln(x+2) = 5$.

    (A) $\sqrt{4+e^5}$ (B) $-\sqrt{4+e^5}$ (C) $\pm\sqrt{4+e^5}$

    (D) 3   (E) answer not given

5. If 800 is divided into parts proportional to 2, 9 and 29, the smallest part is _____.

    (A) 580   (B) 240   (C) 220

    (D) 40   (E) 180

6. Evaluate $\dfrac{4!}{2!0!}$

    (A) 24   (B) undefined   (C) 12

    (D) 4   (E) 60

7. Find the slope of the normal line to $y = \sin(3x)$, when x = 0.

    (A) 3   (B) 1   (C) 1/3

    (D) -1   (E) -3

8. Find the slope of the line tangent to $y = \tan^{-1}(x)$, when x = 0.

    (A) 3   (B) 1   (C) 1/3

    (D) -1   (E) -3

9. Find the value of c guaranteed by the Mean Value Theorem, given the function $y = \sqrt{x}$, over the interval [1, 4].

    (A) 2   (B) 2.25   (C) 2.5

    (D) 2.75   (E) 3

10. Find the area of the figure defined by $3x^2 + 3y^2 - 12x + 18y - 61 = 0$.

    (A) $\dfrac{100\pi}{9}$ (B) $\dfrac{100\pi}{3}$ (C) 100π

    (D) 300π (E) answer not given

11. In the formula, $y = \dfrac{a^2 b}{k^4 xt}$, if k is doubled, b, x, and t are held constant, and the result of y is quadrupled, what must have happened to a?

    (A) kept constant   (B) doubled   (C) quadrupled

    (D) multiplied by 8   (E) multiplied by 16

12. When $3x^7 + 2x^4 + 3x + 1$ is divided by x − 1, the result is _____.

    (A) -3   (B) -1   (C) 0

    (D) 3   (E) 9

13. Calculate $\lim\limits_{x \to 5} \dfrac{x-5}{3x^2 - 19x + 20}$.

    (A) 0   (B) undefined   (C) 1/11

    (D) 1/9   (E) 1/7

14. Evaluate $i^{83}[5i^2 + 7i]$.

    (A) 5i + 7   (B) 7i + 5   (C) 5i − 7

    (D) 7i − 5   (E) answer not given

For questions 15 − 17, suppose $f(x) = \begin{cases} \sqrt{x-11} & \text{if } x > 4 \\ (x-1)^3 & \text{if } x \le 1 \end{cases}$.

15. Find the domain of f(x).

    (A) $(-\infty, 1] \cup (4, \infty)$ (B) $(-\infty, 1] \cup (11, \infty)$ (C) $(-\infty, 1] \cup [11, \infty)$

    (D) $(-\infty, 1] \cup (4, 11) \cup (11, \infty)$ (E) answer not given

16. Find the range of f(x).

    (A) all real numbers   (B) $(-\infty, 0) \cup (0, \infty)$ (C) $(-\infty, 1) \cup (1, \infty)$

    (D) $(-\infty, 1] \cup (4, \infty)$ (E) answer not given

17. Evaluate $f(27) - f(0)$.

    (A) 3   (B) 5   (C) 1

    (D) 4   (E) answer not given

18. The perimeter of an equilateral triangle is 30. Find the area of this triangle.

    (A) 75   (B) 150   (C) $25\sqrt{3}$

    (D) $50\sqrt{3}$ (E) answer not given

19. The perimeter of a 30-60-90 right triangle is $15+5\sqrt{3}$. Find the area of this right triangle.

      (A) 75   (B) 150   (C) $25\sqrt{3}$

      (D) $50\sqrt{3}$ (E) answer not given

20. Solve the equation: $2\sin^2 x - \sin x - 1 = 0$ in the interval $[0, 2\pi]$.

      (A) $\dfrac{\pi}{2}, \dfrac{7\pi}{6}, \dfrac{11\pi}{6}$ (B) $\dfrac{\pi}{2}, \dfrac{4\pi}{3}, \dfrac{5\pi}{3}$ (C) $\dfrac{\pi}{2}, \dfrac{2\pi}{3}, \dfrac{4\pi}{3}$

      (D) $\dfrac{\pi}{2}, \dfrac{5\pi}{6}, \dfrac{7\pi}{6}$ (E) answer not given

21. Eliminate the parameter in the pair of parametric equations: $x = 3t + 5$, $y = 9t^2 - 14$.

      (A) $y = x^2 + 10x + 11$ (B) $y = x^2 + 10x - 11$ (C) $y = x^2 - 10x + 11$

      (D) $y = x^2 - 10x - 11$ (E) answer not given

22. Find the polar representation of the Cartesian point (3, 4).

      (A) (.927, 5)   (B) (5, .927)   (D) (5, 53.13)

      (D) (53.13, 5)   (E) answer not given

23. Find the 13th term in the arithmetic sequence: $4, 7, 10, \ldots$

      (A) 37   (B) 40   (C) 43

      (D) 46   (E) 49

24. Find the 11th term in the geometric sequence: $2, 3, 4.5, \ldots$

      (A) $\dfrac{19683}{256}$ (B) $\dfrac{6561}{128}$ (C) $\dfrac{2187}{64}$

      (D) $\dfrac{59049}{512}$ (E) answer not given

25. Find the sum: $\sum_{n=1}^{\infty} 2\left(\dfrac{4}{7}\right)^{n+2}$

   (A) $\dfrac{128}{147}$ (B) $\dfrac{32}{21}$ (C) $\dfrac{8}{3}$

   (D) $\dfrac{512}{1029}$ (E) answer not given

26. Compute the determinant of A: $A = \begin{bmatrix} 4 & 6 \\ 3 & 7 \end{bmatrix}$

   (A) 2   (B) -7   (C) -10

   (D) 10   (E) answer not given

27. Calculate: $\int_{3}^{5} (x^3 - x)dx$

   (A) 16   (B) 32   (C) 64

   (D) 128   (E) answer not given

28. Bob travels 10 miles in 32 minutes by bike, and 42 miles in 39 minutes by car. What is Bob's average speed for his total 71 minute journey?

   (A) 39.944 mph   (B) 40.944 mph   (C) 41.944 mph

   (D) 42.944 mph   (E) 43.944 mph

29. Solve: $\ln\left(\sqrt{x}\right) > 2$

   (A) $\left(e, \infty\right)$ (B) $\left(-\infty, e\right)$ (C) $\left(-\infty, e^4\right)$

   (D) $\left(e^4, \infty\right)$ (D) answer not given

30. The fourth term in a geometric sequence is 15. The ninth term is 87. Find the common ratio of the sequence.

   (A) $\sqrt{\dfrac{87}{15}}$ (B) $\sqrt[3]{\dfrac{87}{15}}$ (C) $\sqrt[4]{\dfrac{87}{15}}$

   (D) $\sqrt[5]{\dfrac{87}{15}}$ (E) answer not given