MATH 1505 Review Exercises

Version A

1. Find the domain of the function
   \[ f(x) = \frac{1}{\sqrt{x - 4}}. \]
   (A) \( \{x \mid x = 4\} \)
   (B) \( \{x \mid x \leq 4\} \)
   (C) \( \{x \mid x > 4\} \)
   (D) \( \{x \mid x \neq 4\} \)

2. For the function graphed below, determine all zeros of \( x \).

   (A) -3 only  (B) -3 and 1  (C) 3  (D) 0

3. Determine if the function \( f(x) = x^3 + \sin x \) is even, odd or neither.
   (A) even  (B) odd  (C) neither

4. Find the extreme value of the quadratic function \( f(x) = x^2 - 8x + 8 \).
   (A) Maximum value 8 occurs at \( x = 4 \).
   (B) Minimum value -8 occurs at \( x = 4 \).
   (C) Maximum value 56 occurs at \( x = 4 \).
   (D) Minimum value 4 occurs at \( x = 4 \).

5. Write \( F(x) = \sqrt{x^2 + 2} \) as the composition of two functions \( f \circ g \).
   (A) \( f(x) = x^2 + 2 \) and \( g(x) = \sqrt{x} \).
   (B) \( f(x) = x^2 \) and \( g(x) = \sqrt{x} + 2 \).
   (C) \( f(x) = \sqrt{x} \) and \( g(x) = x^2 + 2 \).
   (D) \( f(x) = \sqrt{x} + 2 \) and \( g(x) = x^2 \).

6. Find the remainder of \( P(x) = 3x^3 - 2x + 5 \) divided by \( x - 3 \).
   (A) 26  (B) 68  (C) 36  (D) 80

7. Find the sum of all rational roots of the equation \( x^3 - 3x^2 - 13x + 15 = 0 \).
   (A) 3  (B) 7  (C) -5  (D) -3

8. Which of the following statements is true?
   (There is only one correct answer.)
   (A) \( \ln 0 = 1 \)  (B) \( \ln(x + y) = \ln x + \ln y \)
   (C) \( e^{\ln x} = x \)  (D) \( \frac{\ln x}{\ln y} = \ln x - \ln y \)

9. Solve the equation \( 10^{2x-5} = 7 \).
   (A) \( x = \frac{3 + \log 7}{2} \)  (B) \( x = 6 \)
   (C) \( x = \frac{\log 12}{2} \)  (D) \( x = \frac{7}{3 + \log 2} \)

10. A bacteria culture starts with 1,000 bacteria. Suppose that the hourly growth rate of the culture is 45%. Find the number of bacteria after 6 hours.
    (A) 10,780  (B) 3,703  (C) 27,000  (D) 14,880

11. Determine the function of the following graph.

12. Determine which function represents the following graph.
13. Determine the graph of the function.

14. Find the length of the intercepted arc if the central angle is 60° and the radius is 6 meters.

15. At a point 42 meters from the base of a smokestack, the angle of elevation to the top of the stack is 47°. Find the height of the smokestack to the nearest meter.

16. Given that \( \sin \theta = \frac{4}{5} \), and \( \theta \) is NOT in Quadrant I. Find the exact value of \( \tan \left( -\frac{\pi}{4} \right) \).

17. Find the exact value of \( \tan \left( -\frac{\pi}{4} \right) \).

18. Find angle \( B \) in triangle \( ABC \) if \( a = 70 \), \( b = 122 \) and \( A = 42^\circ \). Find the smallest angle for a triangle having sides of length 9 feet, 15 feet and 19 feet.

19. Find the exact value of \( \sec t \) if the terminal point determined by \( t \) is \( \left( \frac{5}{13}, -\frac{12}{13} \right) \).

20. Given that \( \sin t = \frac{1}{2} \), and \( t \) is in Quadrant II. Find the exact value of \( \cot t \).

21. Identify the period of the function \( y = 2 \cos \left( \frac{1}{2}x - \frac{\pi}{4} \right) \).

22. Identify the phase shift of the function \( y = 3 \sin \left( x - \frac{1}{3} \right) \).

23. Simplify \( \sin \theta \tan \theta + \cos \theta \).

24. Given \( \cos 2\theta = -0.4 \), and \( \theta \) in Quadrant II. Find the value of \( \cos \theta \).
32. Find the value of $\sin \frac{\pi}{4}$.
(A) $-2\sin 2x$ (B) $y = 2\cos 2x$
(C) $y = -2\sin \frac{1}{2} x$ (D) $y = 2\cos \frac{1}{2} x$

31. The following is the graph of the function

33. Find the asymptotes of the hyperbola.
(A) $y = \tan x$ (B) $y = \tan(x + \frac{\pi}{3})$
(C) $y = \cot x$ (D) $y = \cot(x + \frac{\pi}{3})$

34. Find all the solutions of the equation
\[2\cos x + 1 = 0\]
for $0 \leq x < 2\pi$.
(A) $-\frac{\pi}{6}$ and $-\frac{5\pi}{6}$ (B) $-\frac{\pi}{3}$ and $-\frac{5\pi}{3}$
(C) $\frac{2\pi}{3}$ and $\frac{4\pi}{3}$ (D) $\frac{2\pi}{3}$ and $\frac{5\pi}{3}$

35. Solve the equation $\sin 2x = 1$ for $x$ if $0 \leq x < 2\pi$.
(A) $\frac{\pi}{4}$ (B) $\frac{\pi}{6}$ and $\frac{5\pi}{6}$ (C) $\frac{3\pi}{4}$ and $\frac{7\pi}{4}$
(D) $\frac{\pi}{4}$ and $\frac{5\pi}{4}$

36. Find the focus of the parabola $y^2 = -4x$.
(A) $(0, -1)$ (B) $(1, 0)$ (C) $(-1, 0)$
(D) $(0, 1)$

37. The equation of a hyperbola is $\frac{x^2}{4} - \frac{y^2}{9} = 1$. Find the asymptotes of the hyperbola.
(A) $\frac{x}{4} \pm \frac{y}{3} = 0$ (B) $\frac{x}{4} \pm \frac{y}{3} = 0$
(C) $\frac{x}{4} \pm \frac{y}{9} = 1$ (D) $\frac{x}{4} \pm \frac{y}{9} = 1$

38. Find an equation for the hyperbola that has vertices at $(0, \pm 8)$ and foci at $(0, \pm 10)$.
(A) $\frac{x^2}{64} - \frac{y^2}{36} = 1$ (B) $\frac{x^2}{36} - \frac{y^2}{64} = 1$
(C) $\frac{x^2}{36} - \frac{y^2}{64} = 1$ (D) $\frac{x^2}{64} - \frac{y^2}{36} = 1$

39. Find the focus of the parabola whose equation is $(y + 5)^2 = -16(x - 2)$.
(A) $(6, -5)$ (B) $(2, -1)$ (C) $(2, -9)$
(D) $(-2, -5)$

40. The rectangular coordinates of a point is $(-1, 1)$. Find its polar coordinates.
(A) $(\sqrt{2}, \frac{\pi}{4})$ (B) $(\sqrt{2}, \frac{3\pi}{4})$
(C) $(1, -\frac{\pi}{3})$ (D) $(\sqrt{2}, \frac{3\pi}{4})$

41. The polar coordinates of a point are $(2, \frac{\pi}{4})$. Find its rectangular coordinates.
(A) $(1, -\sqrt{3})$ (B) $(-1, \sqrt{3})$ (C) $(-\sqrt{3}, 1)$
(D) $(-\sqrt{3}, -1)$

42. Find the rectangular equation for the curve defined by $x = 3\cos t$, $y = 3\sin t$, $0 \leq t < 2\pi$.
(A) $3x^2 + 3y^2 = 1$ (B) $x^2 + y^2 = 9$
(C) $9x^2 + 9y^2 = 1$ (D) $x^2 + y^2 = 3$

43. Let $u = 6i + 2j$ and $v = 4i - 5j$. Find $u - 2v$.
A) $14i + 8j$ B) $-2i - 8j$ C) $-2i + 12j$
D) $14i + 12j$

44. Let $u = <8, -5>$ and $v = <3, 4>$. Find the angle between $u$ and $v$.
A) $75^\circ$ B) $89^\circ$ C) $68^\circ$ D) $85^\circ$

45. Find the trigonometric form with $0^\circ \leq \theta < 360^\circ$ for the complex number $1 - \sqrt{3}i$.
A) $2(\cos 240^\circ + i \sin 240^\circ)$
B) $\sqrt{10}(\cos 60^\circ - i \sin 60^\circ)$
C) $2(\cos 300^\circ + i \sin 300^\circ)$
D) $\sqrt{10}(\cos 120^\circ + i \sin 120^\circ)$

46. Let $z_1 = 3(\cos \frac{\pi}{3} + i \sin \frac{\pi}{3})$ and $z_2 = 4(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$. Find $z_1 \cdot z_2$.
A) $12i$ B) $12$ C) $-12i$ D) $-12$

47. Which of the following is one of the square roots of $z = 4(\cos \frac{\pi}{4} + i \sin \frac{\pi}{4})$?
A) $2(\cos \frac{\pi}{8} + i \sin \frac{\pi}{8})$
B) $2(\cos \frac{7\pi}{8} + i \sin \frac{7\pi}{8})$
C) $2(\cos \frac{\pi}{8} + i \sin \frac{\pi}{8})$
D) $2(\cos \frac{7\pi}{8} + i \sin \frac{7\pi}{8})$
48. Find the equation of the following graph.

(A) \( y^2 = 8x \)  
(B) \( y^2 = 4x \)  
(C) \( x^2 = 4y \)  
(D) \( x^2 = 8y \)

49. Find an equation for the ellipse whose graph is shown below.

(A) \( (x+2)^2 + (y-3)^2 / 9 = 1 \)  
(B) \( (x-2)^2 + (y+3)^2 / 4 = 1 \)  
(C) \( (x-2)^2 + (y+9)^2 / 9 = 1 \)  
(D) \( (x+2)^2 + (y-3)^2 = 1 \)

50. The polar equation of the following graph is

(A) \( r = 1 + \cos \theta \)  
(B) \( r = -2 \cos \theta \)  
(C) \( r = 1 - \sin \theta \)  
(D) \( r = 2 \sin \theta \)

51. Find the nth term of a sequence whose first several terms are \(-\frac{1}{3}, \frac{1}{9}, -\frac{1}{27}, \frac{1}{81}, \ldots\)

(A) \((-1)^n \frac{1}{3^n}\)  
(B) \((-1)^n \frac{1}{3n}\)  
(C) \(\frac{1}{3^n}\)  
(D) \(-\frac{1}{3^n}\)

52. Find the sum \( \sum_{k=1}^{4} k^2 \).

(A) 4  
(B) 10  
(C) 16  
(D) 30

53. Determine the nth term of the arithmetic sequence: 11, 8, 5, 2, · · ·

(A) \(11 + 3n\)  
(B) \(14 - 3n\)  
(C) \(8 + 3n\)  
(D) \(11 \cdot 3^{n-1}\)

54. Find the partial sum \( S_n \) of the arithmetic sequence with \( a = 3, \ d = 2 \) and \( n = 10 \)

(A) 130  
(B) 768  
(C) 120  
(D) 1536

55. The first term of a geometric sequence is 27, and the second term is 9. Find the fifth term.

(A) \(\frac{1}{3}\)  
(B) 1  
(C) \(\frac{1}{9}\)  
(D) -3

56. Find the sum of the infinite geometric series \( \frac{2}{5} + \frac{4}{25} + \frac{8}{125} + \cdots \).

(A) \(\frac{2}{5}\)  
(B) \(\frac{4}{5}\)  
(C) \(\frac{2}{3}\)  
(D) \(\frac{2}{3}\)

Answers

37. A  38. A  39. D  40. A
41. B  42. B  43. C  44. D
45. C  46. A  47. D  48. D
49. A  50. C  51. A  52. D

57. Find the partial sum \( S_n \) of the geometric sequence with \( a = 3, \ r = 2 \) and \( n = 10 \)

(A) 130  
(B) 768  
(C) 120  
(D) 1536