1. (1 point) Find $\sum_{i=1}^{4} (i^2 - 1)$

2. (1 point) Find $\sum_{i=1}^{\infty} \frac{2}{6^i}$

3. (1 point) What is the 61-st term of the sequence 7, 11, 15, 19, . . . ?

4. (1 point) What is the 57-th term of $-3, 6, -12, 24, . . .$?

5. (2 points) What is the sum of the first 60 terms of the sequence 3, 5, 7, 9, . . . ?
6. (1 point) Suppose a set $A$ contains 243 objects. How many 92 object subsets of $A$ are there?

6. __________

7. (1 point) How many ways are there to choose and order 49 objects from a collection of 304 objects?

7. __________

8. (1 point) How many different ways are there to order 93 different objects?

8. __________

9. (1 point) You’re decorating a room by choosing a color of paint for the walls, and a color of carpet. You have 6 different colors of paint to choose from, and 11 different colors of carpet to choose from. How many different wall and floor color combinations could you create?

9. __________

10. (2 points) Write $\binom{9}{3}$ as an integer in standard form.

10. __________

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Points earned: ______ out of a possible 6 points
For #11–#15, write the given number as a rational number in standard form

11. (1 point) \((\frac{27}{8})^{-\frac{3}{2}}\)

12. (1 point) \(a^0\) (assume that \(a \neq 0\)) (Hint: This is related to the graph of \(a^x\).)

13. (1 point) \(\log_a(1)\) (assume that \(a > 0\) and \(a \neq 1\)) (Hint: This is related to the graph of \(\log_a(x)\).)

14. (2 points) \(7^{-4}\sqrt[7]{7^5} \left(7^{\frac{1}{2}}\right)^3\)

15. (2 points) \(\log_3\left(\frac{1}{\sqrt[3]{81}}\right)\)

Points earned: ______ out of a possible 7 points
16. (1 point) Find $g \circ f(x)$ if $f(x) = x + 2$ and $g(x) = x^2$

17. (2 points) Find $x$ where $x^3 \left( \frac{1}{2}x + 3 \right)^3 = 8$

18. (2 points) Find $x$ where $2 \left( \frac{e^{2x}}{e^{x+3}} \right) + 5 = 7$

19. (2 points) Find $x$ where $4 \log_e(x) + \log_e(x^3) + 8 = 11$

20. (2 points) Find the inverse of $g(x) = 7 \log_e(x + 3)$
21. (1 point) What is the implied domain of \( g(x) = \frac{x^3}{2} - 7\sqrt[3]{x} - 4 \)?

22. (2 points) What is the implied domain of \( f(x) = x^2 - 2x + \log_e(3 - 7x) \)?

23. (2 points) Find \( \frac{x^3 - 3x^2 - 5x + 14}{x^2 - 4} \)
24. (1 point) Find a root of $x^3 + 2x^2 - x + 6$

25. (2 points) How many roots does $2x^2 - 3x + 4$ have?

26. (2 points) Completely factor $-2x^3 + 2x + 12$. (Hint: 2 is a root.)

27. (2 points) Complete the square: Write $-2x^2 - 4x - 5$ in the form $\alpha(x+\beta)^2 + \gamma$ where $\alpha, \beta, \gamma \in \mathbb{R}$. 

Page 7 Points earned: ______ out of a possible 7 points
28. (1 point) $|x - y|$ is the distance between which two numbers?

29. (2 points) Solve for $x$ if $|3x - 2| < 4$

30. (1 point) What is the determinant of the matrix below?

$$\begin{pmatrix} 2 & -3 \\ 1 & -5 \end{pmatrix}$$

31. (2 points) Find the product

$$\begin{pmatrix} 1 & 0 \\ 3 & 1 \end{pmatrix} \begin{pmatrix} 1 & 2 \\ 0 & 1 \end{pmatrix}$$

32. (2 points) What is the inverse of the matrix below?

$$\begin{pmatrix} 1 & 4 \\ 2 & 3 \end{pmatrix}$$
33. (1 point) Write the following system of three linear equations in three variables as a matrix equation

\[\begin{align*}
2x - y + z &= 2 \\
y + 2z &= 1 \\
-x + y - z &= 0
\end{align*}\]

34. (2 points) Solve for \(x, y,\) and \(z\) if

\[
\begin{pmatrix}
-1 & 2 & -1 \\
-2 & 2 & -1 \\
3 & -1 & 1
\end{pmatrix}
\begin{pmatrix}
x \\
y \\
z
\end{pmatrix}
= \begin{pmatrix}
-2 \\
2 \\
1
\end{pmatrix}
\text{ and }
\begin{pmatrix}
-1 & 2 & -1 \\
-2 & 2 & -1 \\
3 & -1 & 1
\end{pmatrix}^{-1}
= \begin{pmatrix}
1 & -1 & 0 \\
-1 & 2 & 1 \\
-4 & 5 & 2
\end{pmatrix}\]
For #35–#40, mark and label x- and y-intercepts (if there are any).

35. (2 points) 3

36. (2 points) \( x \)

37. (2 points) \( x^2 \)

38. (2 points) \( x^3 \)

39. (2 points) \( \sqrt{x} \)

40. (2 points) \( \sqrt[3]{x} \)

Points earned: ______
out of a possible 12 points
For #41–#46, mark and label x- and y-intercepts (if there are any).

41. (2 points) \( \frac{1}{x} \)

42. (2 points) \( \frac{1}{x^2} \)

43. (2 points) \( e^x \)

44. (2 points) \( \log_e(x) \)

45. (2 points) \( -2e^{-x} \)

46. (2 points) \( -3\sqrt{x} + 2 \)

Points earned: ______ out of a possible 12 points
47. (2 points) $f : (-2, 0] \rightarrow \mathbb{R}$
   where $f(x) = x^2$

48. (2 points) $g : \{-4, -2, 2\} \rightarrow \mathbb{R}$
   where $g(x) = \frac{1}{2}x - 1$

49. (2 points) $4(x + 2)^2 + 1$
50. (2 points) Graph \( p(x) \) and label all \( x \)-intercepts:

\[
p(x) = -2(x + 1)(x + 1)(x - 2)(x^2 + 1)
\]

51. (2 points) Graph \( r(x) \), and label all \( x \)-intercepts and all vertical asymptotes:

\[
r(x) = \frac{-3(x - 1)(x - 1)}{4(x + 2)(x^2 + 1)}
\]
52. (2 points) \( h(x) = \begin{cases} e^x & \text{if } x \neq 1 \\ -3 & \text{if } x = 1 \end{cases} \)

53. (2 points) \( m(x) = \begin{cases} 1 & \text{if } x \in (-\infty, 1) \\ 3 & \text{if } x = 1 \\ x^2 & \text{if } x \in (1, 2] \end{cases} \)