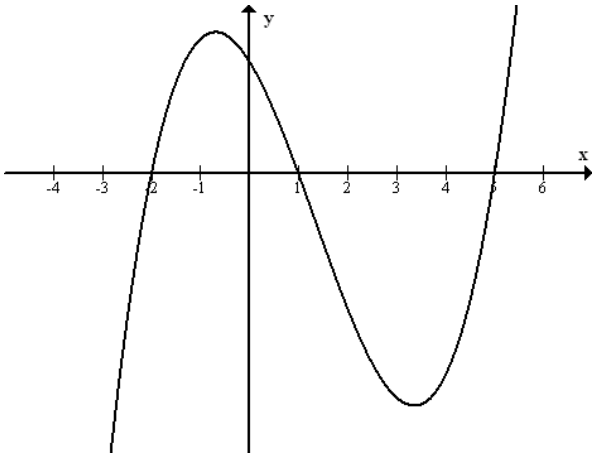
Math 3 Final Exam Study Guide



1. List all the zeros of the function whose graph is shown.

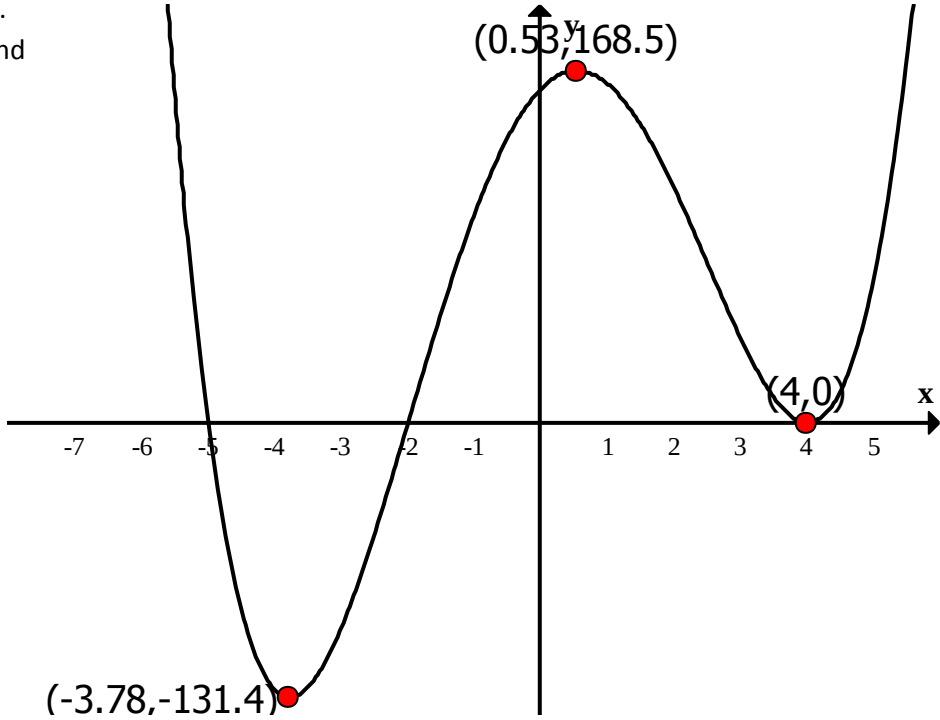
2. The inflection point of the function $f\ x\ = 3\ x + 7\ ^{3} + 1$ is at _____.

3. Find the degree and leading coefficient of $y = 3x^5 - 7x^4 + 9x^7 - 2x + 8$

4. Which of the following functions is odd?
   a. $y = x^2 + 6$ b. $y = 8x^4 + 6x^3 + 10x^2 + 14x$ c. $y = 5x^3 + 6x$ d. $y = 7x^3 + 6x + 1$

5. Which of the following functions is even?
   a. $y = x^2 + 6$ b. $y = 8x^4 + 6x^3 + 10x^2 + 14x$ c. $y = 5x^3 + 6x$ d. $y = 7x^3 + 6x + 1$

6. Find all extrema of the function shown. List relative and absolute maximums and minimums.



7. List the intervals of increase and decrease:

8. List the zeros of the function:

Simplify the following:

9. $\sqrt{4x^6y^3z^8}$

10. $\sqrt[5]{x^5y^{15}z^{13}}$

11. $\sqrt[4]{16x^8y^{12}z^{22}}$

12. $\frac{4x^{-2}y^3}{2\ x^2y^{-1}\ ^3}$

13. $\frac{8x^3}{4x^5}$

14. $3x^{-2}y^{5\ -3}$

Convert between log and exponential form:

15. $\log_2 x = y$

16. $b^t = m$

17. $5^{-2} = \frac{1}{25}$

18. Divide using long division $2x^3 + 5x^2 - 2x + 9 \ \div \ x + 3$

19. Divide using synthetic division $5x^4 + 3x^2 - 6x + 1 \ \div \ x + 2$

20. What is the remainder of $(6x^3 - 2x^2 + 3) \div (x - 3)$?

21. Is $(x - 3)$ a factor of $(x^3 - 27)$? Why or why not?

22. List all possible rational roots of $f\ x\ = 2x^5 - 3x^2 + 5x + 3$

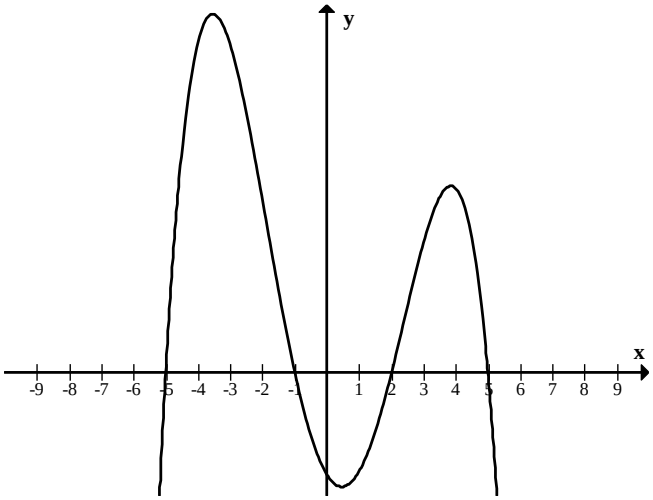
23. A polynomial function with integral (integer) coefficients has five roots. Three of the roots are $x = 8$, $x = 2 - 5i$, and $x = 7 + \ \overline{3}$. The other two roots must be: _____

24. Find all roots: $x^4 - x^3 - 7x^2 + x + 6 = 0$

25. Solve for x: $x - 3 \ \ x + 4 \ \ 2x - 1 \ \ x + 7 \ = 0$

26. Solve for x: $x^4 + x^3 - 5x^2 + x - 6 = 0$

27. Solve for x: $x + 4 \quad x - 7 \quad x + 1 \ \leq 0$



For #28-29, use the graph of $f(x)$ shown to the right.

28. Solve $f\ x\ < 0$

29. Solve $f\ x\ \geq 0$

Use the following for questions #30-41.

$A = \begin{matrix} -3 & 2 \\ -5 & 3 \end{matrix}$ $B = \begin{matrix} 0 & -5 \\ 3 & -2 \end{matrix}$ $C = \begin{matrix} 4 & -7 & 1 \\ -3 & -2 & -2 \end{matrix}$ $D = \begin{matrix} 6 \\ -2 \end{matrix}$ $E = \begin{matrix} 3 & -2 & 1 \end{matrix}$

30. $A - B$ 31. BC 32. BD 33. A^T

34. $3A - 2B$ 35. DE 36. EC^T 37. DB

38. $|A|$ 39. $|C|$ 40. A^{-1} 41. D^{-1}

42. $\begin{matrix} 2 & -8 & 5 \\ -3 & 0 & 1 \\ 1 & 4 & 0 \end{matrix}$

43. $A = \begin{matrix} 3 & -2 & 12 \\ 10 & 5 & -9 \\ 11 & -8 & 7 \end{matrix}$ $A_{11} =$ $A_{23} =$ $A_{32} =$ $A_{31} =$

44. A triangle has vertices at (-3, 0), (2, 5), and (1, -7) . Find the area of the triangle using matrices.

45. Use $A = \begin{matrix} 4 & 3 \\ 1 & -2 \end{matrix}$, $B = \begin{matrix} -4 & 2 \\ 5 & 0 \end{matrix}$, and $C = \begin{matrix} 1 & -2 \\ 0 & 1 \end{matrix}$. Which of the following is **not** correct?

a. $A + B = B + A$

b. $AB = BA$

c. $A\ B + C\ = AB + AC$

d. $A + B\ + C = A + \ B + C$

46. Write this system of equations $\begin{matrix} 2x + y - 2z = -1 \\ 3x + 4y = -2 \\ 5x + 2z - y = 4 \end{matrix}$ in matrix form:

47. Solve the equation $\begin{matrix} 2 & 0 \\ -1 & 3 \end{matrix} \begin{matrix} x \\ y \end{matrix} = \begin{matrix} 0 \\ 1 \end{matrix}$

48. Solve the equation $\begin{matrix} 2 & 3 & 8 \\ 5 & -2 & 1 \\ -3 & 4 & 0 \end{matrix} \begin{matrix} x \\ y \\ z \end{matrix} = \begin{matrix} 3 \\ 0 \\ -2 \end{matrix}$

49. Jill has 60 total coupons of two different types. Coupons of type A are worth \$2 and coupons of type B are worth \$6. If Jill's coupons are worth a total of \$280, how many of each type does she have?

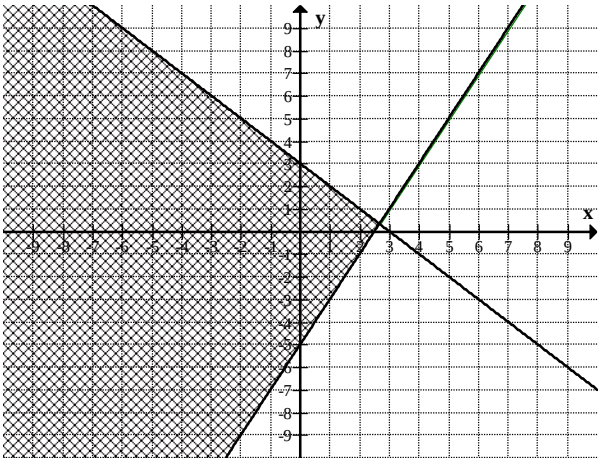
50. The graph to the right could represent which of the following systems of inequalities?

a. $y \leq -x + 3$, $y \leq 2x - 5$

b. $y \leq -x + 3$, $y \geq 2x - 5$

c. $y \geq -x + 3$, $y \leq 2x - 5$

d. $y \geq -x + 3$, $y \geq 2x - 5$



Use the following information for questions 51-53.

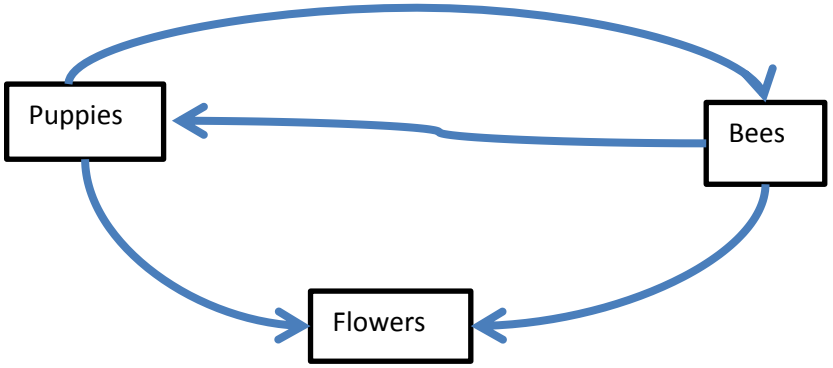
Bob's Toys makes both toy ducks and toy clowns. Let x represent the number of ducks that the company makes each month and y represent the number of clowns that the company makes each month. Bob's Toys must make at least 10 ducks each month and at least 40 clowns each month. At most, they can make 75 total toys each month. Bob's Toys makes \$2 profit for each duck they produce and \$3 profit for each clown they produce.

51. Write the set of constraints for this problem.

52. Write the profit function P(x,y) = _____

53. The corner points of the feasible region are at (10, 40), (10, 65), and (35, 40). How many of each toy should the company make for the maximum profit? What is the maximum profit?

54. Given the food web to the right, create a matrix which represents the same information.

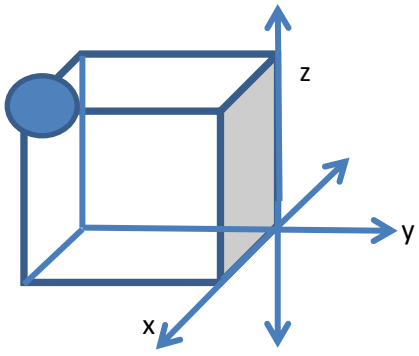


55. The following table represents the sales data for a certain restaurant over two weeks.

	Week 1	Week 2
Pizza	50	100
Pies	70	50

The restaurant sells pizzas for $8 each and pies for $5.50 each. Create appropriate matrices from the information given and use these matrices to determine the total revenue (total sales) for each week.

56. Write one set of possible coordinates for the point shown.



57. What is the distance between (2, -3, 4) and the origin?

58. A rectangular prism has length 8 mm, height 10 mm, and width 14 mm. What is the length of the prism's main diagonal?

59. Use the polynomial equation $f\ x\ = x^4 + 4x^3 - 7x^2 - 22x + 24$.

a. List all possible rational roots for this function.
b. What are the zeros of this function?
c. Write the function in factored form.
d. Sketch the graph of $f(x)$.
e. Solve $f\ x\ \leq 0$ (hint: use the factored form of the equation).

60. The table below represents the data for cell phone subscribers each year.

Year	1995	1996	1997	1998	1999	2000	2001
Subscribers (millions)	9	10	11	18	37	74	135

a. Calculate the differences. Is this data best modeled by a linear, quadratic, cubic, or quartic equation?
b. Write the equation for the best-fitting model.
c. Using your model, predict the number of cell phone subscribers in the year 2005.
d. Graph the equation you listed in part b.
e. Give all extrema of the model. Identify them as minimums or maximums and relative or absolute.