

# 2024 AP Precalculus SUMMER PACKET

DUE Friday, SEPTEMBER 4, 2024

NORTH PLAINFIELD HIGH SCHOOL

YOUR NAME: \_\_\_\_\_ SAIONNI PATRICK \_\_\_\_\_ GRADE: \_\_\_\_\_  
(% COMPLETE + % CORRECT) = \_\_\_\_\_  
2

## DEAR STUDENT,

The purpose of the summer packet is to make sure you are prepared with the prerequisite skills necessary to be successful in your AP Precalculus course.

Page 2 of this packet lists the skills and shows the rubric your teacher will use to grade your packet. Make sure you read both carefully so that you start off the year on the right foot.

Follow these guidelines while completing the assignment:

- You will not receive credit unless you SHOW YOUR WORK!
- Do NOT use a calculator! The purpose of the packet is to sharpen your skills, not how to use a calculator.
- If you do not remember how to solve a problem, go to Khan Academy (<https://www.khanacademy.org/>) and watch a lesson on the topic.
- A great website to practice math skills <https://www.ixl.com/signin/nplainfield>.

This packet is due to your math teacher on **September 4, 2024**. If it is turned in late, you will lose points as noted in the grading rubric. If it is not turned in by Friday, September 6th, you will receive a 0 for your first quiz score in math. **DO NOT LET THIS HAPPEN!** You have all summer to do this assignment!

If you need a paper copy of this packet, they are available in the NPHS central office during summer hours (Monday-Thursday 8am - 12pm and 1pm - 2pm).

**LAUREN HECKENDORF**  
**MATH SUPERVISOR, K-12**  
**NORTH PLAINFIELD HIGH SCHOOL**

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## Skills in this packet

- Simplifying complex fractions
- Simplifying rational expressions and working with rational and negative exponents
- Factoring Function operations, compositions, and inverses
- Solving equations (Linear, Quadratic, Equations with rational exponents , Basic log and exponential equations, Rational equations)
- Writing and graphing equations of lines
- Characteristics of graphs (Intercepts Domain and range Max and min)
- Writing equation from a graph
- Vertical and horizontal transformations of functions
- Parent functions

**Grading rubric: 100 point quiz grade (your first grade of the year in math!!)**

Your score will be graded using this formula:  $\frac{(\% \text{ complete} + \% \text{ correct})}{2}$

The completion percent only includes problems with all work shown. An additional 10 points will be deducted for each day your packet is late.

**THIS IS AN IMPORTANT ASSIGNMENT. BE SMART and start off your year with your best effort!!!**

**Special Cases:**

- If you are absent in the first 3 days of school, you are allowed 1 day per day absent to turn in your assignment.
- If you start NPHS in September, you have 2 weeks after your first day in school to turn this packet into your math teacher.
- If you transfer from one course to another in September, your summer packet score from your original class will transfer with you.
- If you start NPHS after September, you are exempt from completing this packet.

## I. Simplifying Complex Fractions

1. 
$$\frac{1 - \frac{1}{3}}{\frac{1}{2} - \frac{1}{6}}$$

2. 
$$\frac{z - \frac{1}{z}}{1 - \frac{1}{z}}$$

3. 
$$\frac{\frac{1}{x^2} - \frac{1}{y^2}}{\frac{1}{x^2} + \frac{2}{xy} + \frac{1}{y^2}}$$

4. 
$$\frac{a-b}{a^{-1} - b^{-1}}$$

## II. Simplifying Expressions

5. 
$$\frac{s^{-2}t^{-3}}{s^{-1}t^0}$$

6. 
$$x^{m-1} x x^m$$

7. 
$$81^{\frac{3}{4}}$$

8. 
$$(-32a^{10})^{\frac{3}{5}}$$

9. 
$$\left(9^{\frac{1}{2}} + 16^{\frac{1}{2}}\right)^{-2}$$

10. 
$$a^{\frac{1}{2}} \left(a^{\frac{3}{2}} - 2a^{\frac{1}{2}}\right)$$

11. 
$$(2x^2 + 5x + 3)(6x^2 - 5x + 1)^{-1}$$

12. 
$$\frac{a^4 - c^4}{(a+c)^2 (a^2 + c^2)}$$

13. 
$$\frac{3 - 5m - 2m^2}{2m^2 + 7m + 3}$$

## III. Factoring. (Don't forget to look for a GCF!)

14.  $25x^4 - 4x^2$

15.  $x^2 + 9$

16.  $6x^2 + 15x - 36$

17.  $8mn - 10n + 12m - 15$

18.  $2h^3 + 7h^2k - 15hk^2$

19.  $x^3 - 8$

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## IV. Solving Equations.

20.  $\frac{3}{2}(z+5) - \frac{1}{4}(z+24) = 0$

21.  $x^2 + 5x - 24 = 0$

22.  $(x-3)^2 + 9 = 25$

23.  $x^{\frac{4}{3}} = 81$

24.  $\log_5 x = 2$

25.  $5^{2x} = \frac{1}{125}$

26.  $x^3 - 2x^2 - 5x + 6 = 0$

27.  $\frac{2x-1}{(x+2)(x^2+3)} = 0$

28.  $\frac{x}{x+2} - \frac{2}{2x-1} = \frac{1}{5}$

29.  $\sqrt{x} + 1 = 41$

30.  $x + \sqrt{31-9x} = 5$

31.  $|2x-1| = 5$

## V. Equations of Lines

For 32 – 34, write the equation of the line described. State your answer in the form specified.

32. passes through the  $(-2, 3)$  and is perpendicular to the line  $3x + 4y = -7$ ;  
point-slope form

33. slope is undefined and passes through the point  $(4, -5)$

34. x-intercept is 5 and y-intercept is 3; standard form

35. Two values of a linear function  $f(x)$  are  $f(4) = 2$  and  $f(-5) = -1$ . Find the equation of  $f(x)$ .

Use the video to construct a linear regression model in Desmos: [Linear Regression](#)

- a. Using your calculator's regression capabilities to find  $L(G)$ , the linear function of best fit for this data. Write decimal values correct to three decimal places.
  
- b. Use  $L(G)$  to predict the average life span of a kangaroo with a gestational period of 35 days. Give your answers correct to three decimal places and include units of measure.
  
- c. What are the units of the L intercept? What is the meaning of the L intercept? Could this situation occur?
  
- d. What are the units of the slope? What is the meaning of the slope in the context of this problem?

VI. Function Operations, Compositions, and Inverses

For 37 – 44, use  $f(x) = x^3 + 1$ ,  $g(x) = x^2 - 2$ ,  $h(x) = x + 3$

37.  $h(2+a)$

38.  $h(f(x))$

39.  $g(x)+h(x)$

40.  $f(g(2))$

41.  $f(x+h) - f(x)$

42.  $h^{-1}(x)$

43.  $f(x) \circ g(x)$

44.  $g(h(x))$

45. Given  $f(2) = 1$  and the fact that  $g(x) = -2f(x-1) + 5$  to find  $g(3)$ .

### VII. Finding Domain

State the domain of each function.

46.  $f(x) = \frac{1}{x^2 - 4}$

47.  $f(x) = \frac{x-4}{\sqrt{x+3}}$



48.  $f(x) = \sqrt{x-6}$

49.  $f(x) = \log(x-3)$

## VIII. Applications of Systems of Equations

50. A 20 m ladder and a 15 m ladder were leaned against a building. The bottom of the longer ladder was 7 m farther from the building than the bottom of the shorter ladder, but both ladders reached the same distance up the building. Find the distance.

51. Four squares, each with sides 4 cm long, are cut from the corners of a rectangular piece of cardboard having area 560 sq cm. The flaps are then bent up to form an open-topped box having volume 960 cu cm. Find the dimensions of the original piece of cardboard.



### IX. Transformations of Functions

Describe the sequence of transformations from the parent to the given function.

52.  $f(x) = 3(x-1)^2 + 2$

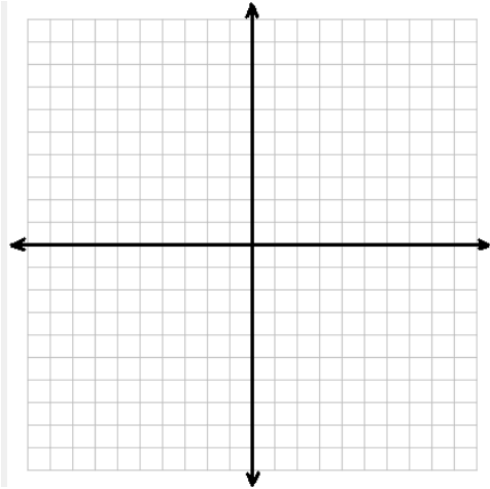
53.  $f(x) = -|x|$

54.  $f(x) = \sqrt{x+4} - 3$

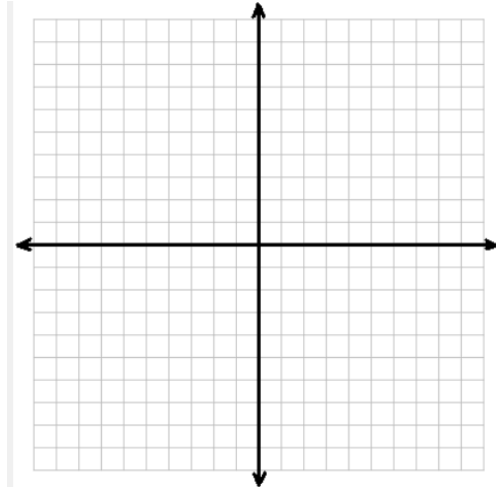
## XI. Parent Functions

For each parent function, give the equation, sketch the graph, and give the domain and range. List asymptotes where applicable.

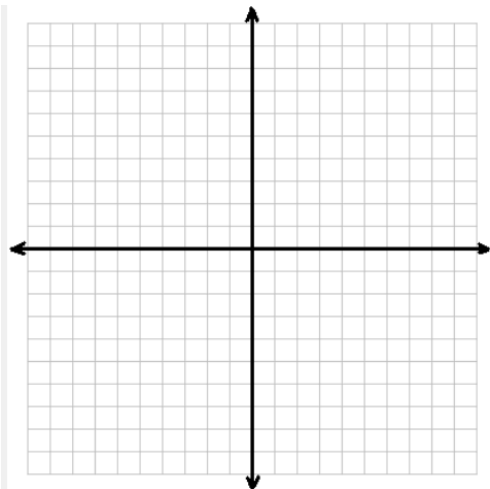
57. Constant



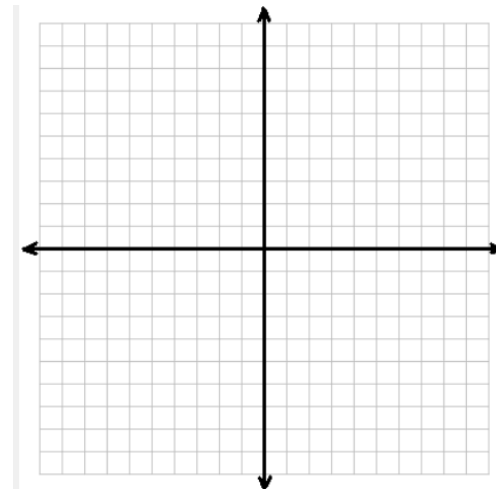
58. Identity



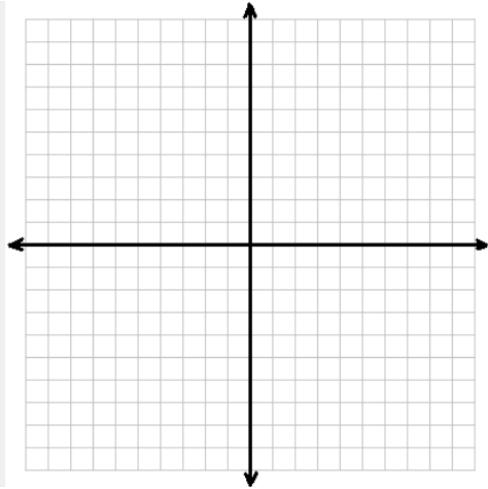
57. Quadratic



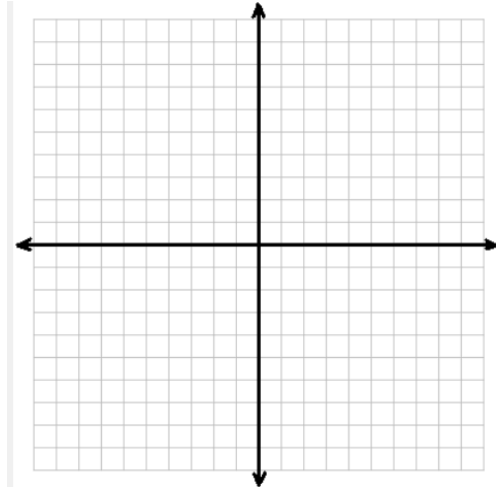
58. Absolute Value



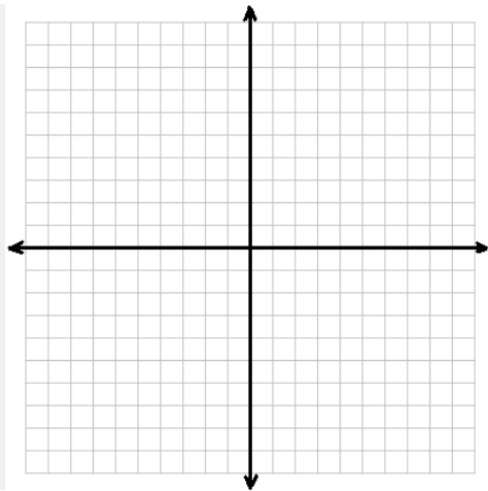
**59. Square Root**



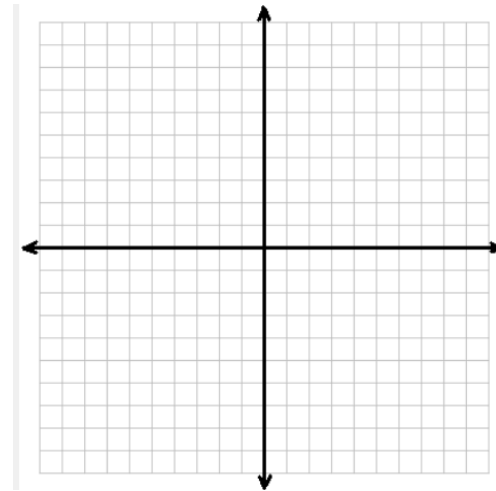
**60. Cubic**



**61. Rational**



**62. Exponential**



## XII. True-False

66.  $9x^{-3} = \frac{1}{9x^3}$

67.  $\frac{x^2+3x}{-6} = \frac{-x^2}{6} - \frac{x}{2}$

68.  $5\left(\frac{x^2}{6}\right) = \frac{5x^2}{30}$

69.  $\frac{2x^2+3y}{3y} = 2x^2+1$

70.  $\sqrt{x+y} = \sqrt{x} + \sqrt{y}$

71.  $\sqrt{x^2+9} = x+3$

72.  $\sqrt{x^2-8x+16} = x-4$

73.  $\ln e^2 = 2$

74.  $e^{t+s} = (e^t)^s$

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## PreAP Precalculus Summer Assignment Key

- |  |  |   |
|--|--|---|
| 1. 2                                   | 31. 3, -2  | 52. vertical stretch by 3<br>horiz. shift right 1<br>vertical shift up 2  |
| 2. $z + 1$                             | 32. $y - 3 = \frac{4}{3}(x + 2)$   |   |
| 3. $\frac{y-x}{y+x}$                   | 33. $x = 4$  | 53. vertical reflection<br>over x axis  |
| 4. $-ab$                               | 34. $3x + 5y = 15$   | 54. horizontal shift left 4<br>vertical shift down 3  |
| 5. $\frac{1}{st^3}$                    | 35. $f(x) = \frac{1}{3}x + \frac{2}{3}$  | 55. x-int: $\approx 0.8, 1.2, -1.9$<br>y-int: $\approx 1.8$<br>domain: $\mathbb{R}$<br>range: $\mathbb{R}$<br>relative max:<br>3 when $x = -1$<br>relative min:<br>-0.25 when $x = 1$ |
| 6. $x^{2m}$                            | 36a. $L(G) = .149G + 2.390$  |   |
| 7. 27                                  | b. $L(35) = 7.605$ yrs.  |   |
| 8. $-8a^6$                             | c. L-intercept is in<br>years. It means<br>that a mammal with<br>a gestational period<br>of 0 has a life span<br>of 2.390 years. |   |
| 9. $\frac{1}{49}$                      | d. $m =$ yrs/day.<br>Average life span<br>increases .149<br>years when<br>gestational period<br>is one day longer.               |   |
| 10. $a^2 - 2a$                         | e. A mammal with<br>gestational period<br>of 38 days is<br>expected to live<br>8 years.  | 56. x-int: 1<br>y-int: -0.27<br>domain: $[-3, \infty)$<br>range: $[-2, \infty)$<br>absolute min:<br>-2 when $x = -3$  |
| 11. $\frac{(x+1)(2x+3)}{(3x-1)(2x-1)}$ |  |   |
| 12. $\frac{a-c}{a+c}$                  | 37. $5 + a$  | 66. F   |
| 13. $\frac{-2m+1}{2m+1}$               | 38. $x^3 + 4$  | 67. T   |
| 14. $x^2(5x-2)(5x+2)$                  | 39. $x^2 + x + 1$  | 68. F   |
| 15. non-real factors                   | 40. 9  | 69. F   |
| 16. $3(2x-3)(x+4)$                     | 41. $3x^2h + 3xh^2 + h^3$  | 70. F   |
| 17. $(2n+3)(4m-5)$                     | 42. $h^{-1}(x) = x - 3$  | 71. F   |
| 18. $h(2h-3k)(h+5k)$                   | 43. $x^5 - 2x^3 + x^2 - 2$   | 72. T   |
| 19. $(x-2)(x^2 + 2x + 4)$              | 44. $x^2 + 6x + 7$   | 73. T   |
| 20. $-\frac{6}{5}$                     | 45. 3  | 74. F   |
| 21. -8, 3                              | 46. $x \neq \pm 2$   |   |
| 22. 7, -1                              | 47. $x > -3$   |   |
| 23. 27                                 | 48. $x \geq 6$   |   |
| 24. 25                                 | 49. $x > 3$  |   |
| 25. $-\frac{3}{2}$                     | 50. 12 cm  |   |
| 26. -2, 1, 3                           | 51. 20 cm x 28 cm  |   |
| 27. $\frac{1}{2}$                      |  |   |
| 28. 3, $-\frac{3}{4}$                  |  |   |
| 29. 1600                               |  |   |
| 30. 3, -2                              |  |   |