

PRE-CALCULUS SUMMER PACKET

This packet is designed to prepare students for their Pre-Calculus courses for the 2020-2021 school year. This work will be used in all Pre-Calc courses, and will help to call back to your math work from the last 2-3 years.

While we understand that the conclusion of the school year last year may not have some of these concepts fresh in your mind, we strongly encourage you to complete this packet prior to the start of the school year in September. This packet is NOT required, but will give you a leg up on starting off the year strong.

If there are concepts or problems you are not familiar with, please feel free to utilize all of the tools available to you on Khan Academy ([khanacademy.org](https://www.khanacademy.org)). Good luck, and we look forward to seeing you in September!

Directions: Complete the following problems on loose-leaf paper and attach it to the back of the packet.

Graph the following equations and inequalities

1. $y = -\frac{1}{2}x - 5$
2. $2x + 3y = 12$
3. $3x + 12y \geq 4$
4. $y < -2x + 1$

5. Determine if the following lines are parallel, perpendicular, or neither
Line 1: through $(-3, 3)$ and $(3, -1)$
Line 2: through $(-2, -3)$ and $(2, 3)$

Solve the following systems of equations using any method

6.
$$\begin{aligned} 2x + 3y &= 5 \\ x - 5y &= 9 \end{aligned}$$

7.
$$\begin{aligned} -2x + y &= 6 \\ 4x - 2y &= 5 \end{aligned}$$

8.
$$\begin{aligned} 3x + 2y &= 6 \\ -6x - 3y &= -6 \end{aligned}$$

9.
$$\begin{aligned} 3x - 7y &= 20 \\ -11x + 10y &= 5 \end{aligned}$$

10.
$$\begin{aligned} 3x + 2y - z &= 8 \\ -3x + 4y + 5z &= -14 \\ x - 3y + 4z &= -14 \end{aligned}$$

Graph the following systems of inequalities

11.
$$\begin{aligned} x + y &\geq -2 \\ -5x + y &< -3 \end{aligned}$$

12.
$$\begin{aligned} y &> 2x - 7 \\ 4x + 4y &< -12 \end{aligned}$$

Simplify the following matrices using the appropriate matrix operations

13.
$$\begin{bmatrix} 4 & 7 \\ -5 & 1 \end{bmatrix} - 6 \begin{bmatrix} -3 & -2 \\ 0 & 6 \end{bmatrix}$$

14.
$$\begin{bmatrix} 4 & 5 \\ 2 & -3 \\ 1 & 9 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ -3 & 4 \end{bmatrix}$$

15.
$$\det \begin{bmatrix} 4 & 5 \\ 1 & 3 \end{bmatrix}$$

16.
$$\det \begin{bmatrix} 8 & 5 & 4 \\ -7 & 2 & 4 \\ 11 & 2 & 9 \end{bmatrix}$$

17. Graph the following quadratic function. Identify the minimum or maximum value then state the domain and range.

a. $y = 2x^2 - 12x + 19$

b. $y = -(x - 2)^2 - 1$

c. $y = (x + 1)(x + 2)$

18. Solve the following quadratic function using any method

a. $x^2 + 6x - 27 = 0$

b. $x^2 - 25 = 0$

c. $-x^2 - 12 = -87$

d. $5x^2 = -5x + 10$

e. $(2x - 5)^2 = 81$

f. $x^2 + 3x - 2 = 0$

19. Simplify the following complex numbers using appropriate complex number operations

a. $(6 + 2i) + (5 - i)$

b. $(-1 - i) + (9 - 3i)$

c. $(7 + 5i)(7 - 5i)$

d. $\frac{2i}{1-i}$

20. Graph the following complex numbers

a. $6 + 2i$

b. $3 - 4i$

c. $-2 + 4i$

21. Classify the following polynomial by degree and number of terms, write the polynomial in standard form, and identify the lead coefficient.

a. $f(x) = 2x + \frac{3}{4}x^4 + 9$

b. $f(x) = -2x^3 + 4x - 5$

c. $f(x) = 12 - 5x$

22. Simplify the following polynomials using the appropriate polynomial operations

a. $(3x^3 + 10x + 5) - (x^3 - 4x + 6)$

b. $8x(14x + 3) + (41x^2 + 3x^3)$

c. $(2x + 5)(3x^3 - x^2 + x)$

23. Divide the following polynomials using any method

a. $(3x^2 + 11x + 1) \div (x - 3)$

b. $(x^4 - 6x^3 - 40x + 33) \div (x - 7)$

24. Determine if the following binomial is a factor of the given polynomial

a. $f(x) = 15x^3 - 119x^2 - 10x + 16; (x - 8)$

25. Find the inverse of the following polynomial

a. $y = -9x - 4$

b. $y = 5x^3 + 7$

c. $y = \sqrt[5]{x - 3} - 2$

26. Solve the following compositions: $f(x) = 6x + 4$ and $g(x) = x^2 + 3x - 2$

a. $f(g(x))$

b. $g(f(2))$

c. $f(x) - g(x)$

27. Simplify the following rational expressions

a. $7^{\frac{1}{2}} * 7^{\frac{1}{4}}$

b. $\sqrt[5]{\frac{x^{10}}{y^5}}$

c. $(\sqrt[3]{x^2} * \sqrt[3]{x^4})^2$

d. $\frac{xy^{5/3}}{x^{-1/2}y^{1/3}}$

e. $\sqrt[3]{-27x^9y^{15}}$

28. Rewrite the following exponentials in logarithmic form

a. $2^3 = 8$

b. $4^3 = 64$

29. Rewrite the following logarithms in exponential form

a. $\log_4 1024 = 5$

b. $\log_{12} 144 = 2$

30. Solve the following exponential and logarithmic equations

a. $5^{3-2x} = 5^{-x}$

b. $64^a = 8^{a+2}$

c. $3^x = 17$

d. $16^{n-7} + 5 = 24$

e. $e^{x-1} - 5 = 5$

31. Lea invests \$5000 in a savings account with a fixed annual interest rate of 6%. Find the balance after 10 years if the interest is compounded:

a. annually

b. quarterly

c. daily

d. continuously