

# Calculus

## Summer Packet

This packet of exercises reflects skills that the Math Department considers essential for your success in Calculus!

In this packet you will find the following:

- Questions on material previously learned in any of your math courses prior to calculus.
- Topics from Khan Academy referenced in the directions for each problem set. If you are having difficulty recalling how to do a specific type of problem, the Khan Academy videos are an excellent resource for re-teaching. Go to [www.khanacademy.org](http://www.khanacademy.org), type in the phrase provided, and it will take you to a video(s) about the topic. Khan Academy also provides further practice on the topics that you can do for your own self-assessment.
- If Kahn Academy is not enough help, here are some other websites that may be of help.
  - Most algebra topics: <http://www.purplemath.com/modules/index.htm>
  - Trig Information <http://www.mathematicshelpcentral.com/index.html>  
Once in the site, go to lecture notes

**Your Responsibility is to:**

- Complete all problems and show all necessary work **clearly and carefully**
- Turn in the packet on **THE FIRST DAY OF SCHOOL!** It will be collected and checked for completion on the first day of school.

**You will be tested on the material within the first two weeks of school.**

**Have a great summer!**

Name \_\_\_\_\_

**Topic 1: Fractional & Negative Exponents:**

Simplify using only positive exponents.

1.  $2\left(\frac{2}{2-x}\right)\left[\frac{-2}{(2-x)^2}\right]$

2.  $\frac{\sqrt{4x-16}}{\sqrt[4]{(x-4)^3}}$

**Topic 2: Domain:** (Khan Academy Topic: "Domain of advanced functions")

Find the domain of the following functions.

3.  $y = \log(2x - 12)$

4.  $y = \sqrt{3x - 15}$

5.  $y = \frac{x}{x^2 - 9}$

**Topic 3: Solving Inequalities (Absolute Value):** (Khan Academy Topic: "Solving absolute value inequalities")

Solve the following absolute value inequalities.

6.  $|x - 3| > 12$

7.  $|x - 3| \leq 4$

8.  $|3x - 4| > -2$

9.  $|x - 6| < -8$

**Topic 4: Solving inequalities (with Quadratics):** (Khan Academy Topic: "Quadratic inequalities")

Solve the following by factoring and making appropriate sign charts.

10.  $x^2 - 16 > 0$

11.  $x^2 - 3x \geq 10$

**Topic 5: Special Factorization:** (Khan Academy Topic: "Advanced polynomial factorization methods")

Factor completely.

12.  $27x^3 - 125y^3$

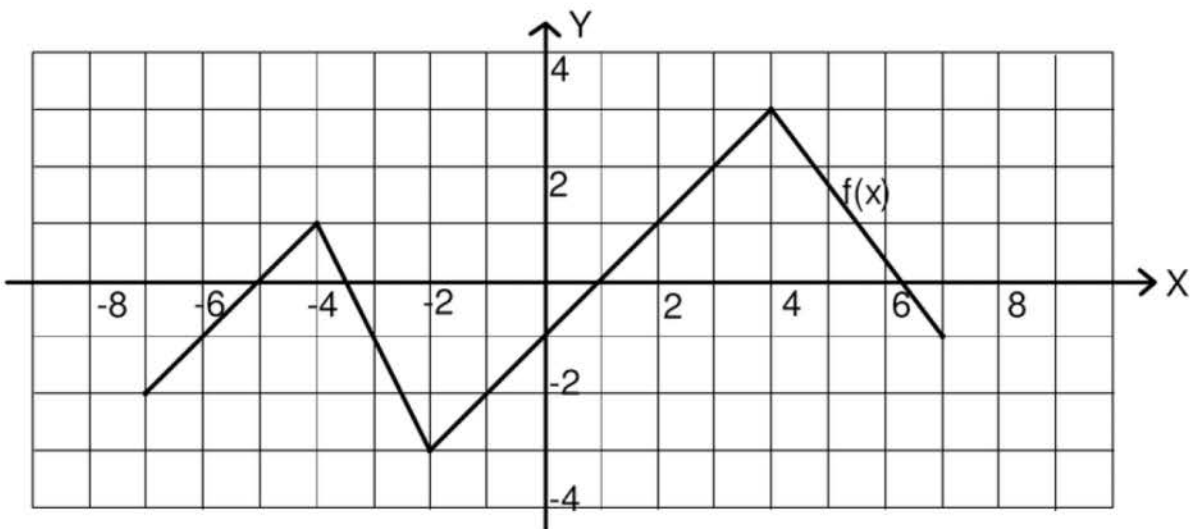
13.  $2x^2 + 50y^2 - 20xy$

15.  $x^3 - xy^2 + x^2y - y^3$

16.  $(x - 3)^3(2x + 1)^3 + (x - 3)^4(2x + 1)^2$

**Topic 6: Evaluating Functions:**

Use the graph of  $y = f(x)$ , to evaluate the value of  $f(x)$ .



17a.  $f(-4) =$

17b.  $3f(3) =$

18a. If  $x = 5$ , what  
does  $f(x + 2) =$

18b.  $|f(-2)| =$

19.  $-f(-7) + 3f(2)$

20.  $f|-3| =$

**Topic 7: Even and Odd functions:** (Khan Academy Topic: "Intro to function symmetry")

Show work to determine if the relation is even, odd, or neither.

21.  $f(x) = 2x^2 - 7$

22.  $f(x) = -4x^3 - 2x$

23.  $f(x) = 4x^2 - 4x + 4$

**Topic 8: Asymptotes:** (Khan Academy Topic: "Graphing rational functions according to asymptotes")

For each function, find the equations of both the vertical asymptote(s) and horizontal asymptotes (if they exist).

$$24. y = \frac{x^2 - 2x + 1}{x^2 - 3x - 4}$$

$$25. y = \frac{2x^2 + 6x}{x^3 - 3x^2 - 4x}$$

**Topic 9: Complex Fractions:** (Khan Academy Topic: "Nested fractions")

Simplify the following.

$$26. \frac{x^{-3} - x}{x^{-2} - 1}$$

$$27. \frac{\frac{x}{1-x} + \frac{1+x}{x}}{\frac{1-x}{x} + \frac{x}{1+x}}$$

**Topic 10: Composition of Functions:** (Khan Academy Topic: "Evaluating composite functions")

If  $f(x) = x^2$ ,  $g(x) = 2x - 1$ , and  $h(x) = 2^x$ , find the following

28.  $g\left(f\left(h\left(\frac{1}{2}\right)\right)\right)$

29.  $g(g(x))$

**Topic 11: Solving Rational (fractional) Equations:** (Khan Academy Topic: "Equations with rational expressions")

Solve each equation for  $x$ .

30.  $\frac{x}{2x-6} - \frac{3}{x^2-6x+9} = \frac{x-2}{3x-9}$

**Topic 12: Trigonometry** (Khan Academy Topic: "Trigonometric Functions")

Find the exact value of the following without calculators:

31.  $\sin^2 \frac{5\pi}{4} - \cos^2 \frac{5\pi}{3}$

32.  $6 \sec \pi - 4 \cot \frac{\pi}{2}$

33.  $\left(4 \cos \frac{\pi}{6} - 6 \sin \frac{2\pi}{3}\right)^{-2}$

34.  $\sin \frac{\pi}{3}$

35.  $\tan \frac{4\pi}{3}$

36.  $\csc \frac{5\pi}{6}$

37.  $\tan \frac{3\pi}{4}$

Evaluate the inverse trigonometric function

38.  $\arcsin\left(-\frac{\sqrt{3}}{2}\right)$

39.  $\arccos\left(-\frac{1}{\sqrt{2}}\right)$

40.  $\arctan(\sqrt{3})$

41.  $\text{arc csc}(2)$

**Topic 13: Logarithmic Rules:** (Khan Academy Topic: "Using the properties of logarithms: multiple steps")

Simplify the expression using rules for logarithms.

42.  $\log_2 x + \log_2(x - 2)$

43.  $3 \ln x^2 - \frac{1}{2} \ln(x + 3) + \ln 5$

Use log rules to expand the expression.

44.  $\log_2 \frac{x^4}{\sqrt{2x - 5}}$

45.  $\ln \frac{3x^5 \sqrt[3]{(x+5)^2}}{(2x+7)^4}$