

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

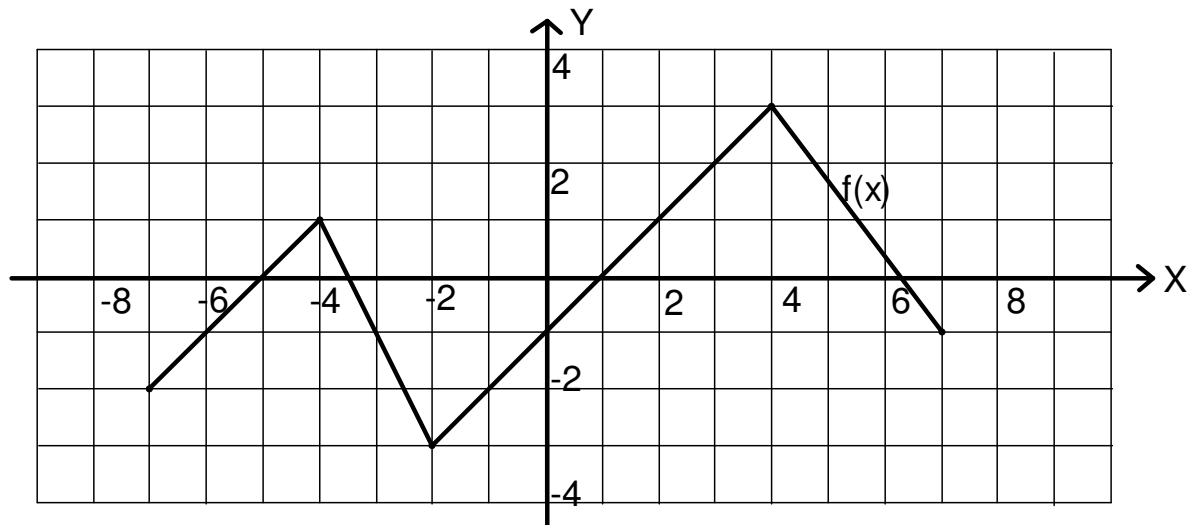
13. $2x^2 + 50y^2 - 20xy$

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. $\operatorname{arc} \csc(2)$

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