



Celina High School Math Department
Summer Review Packet
AP CALCULUS

DUE THE FIRST DAY OF SCHOOL!
*This work will count as part of your first
quarter grade.*

The problems in this packet are designed to help you review topics from previous mathematics courses that are important for your success in Calculus.

Directions: Complete the problem sets on a separate sheet of paper. Show all of your work in order to receive full credit. Clearly number each problem and box your solutions. You may use your notes from previous math courses to help you. It is a good idea to work one problem set per week this summer. *Do not wait until the week before school starts!*

Additional copies of this packet may be obtained by emailing Valerie Carey.
valeriecarey@celinaisd.com. Copies may also be found in the AP Calculus 2017-2018 Google Classroom; code: 3ea6cr.

Helpful websites:
<http://www.khanacademy.org/>
wolframalpha.com

Enjoy your summer. We are looking forward to meeting you! The following is a list of *big ideas* from previous years that you should know prior to entering this course.

Calculus Prerequisites

To successfully complete AP Calculus AB, a student must prior to the course:

- Complete four years of secondary mathematics designed for college-bound students.
- Study algebra, geometry, trigonometry, analytic geometry and elementary functions.
- Be familiar with the properties, algebra and graphs of the following functions: linear, polynomial, rational, exponential, logarithmic, trigonometric, inverse trigonometric and piecewise defined.
- Understand the language of functions (domain, range, odd, even, periodic, symmetry, zeros, intercepts etc.).
- Know the values of the trig functions of the numbers $0, \frac{\pi}{6}, \frac{\pi}{4}, \frac{\pi}{3}, \frac{\pi}{2}$, and their multiples.

You should be able to:

- 1) Evaluate functions including piece-wise defined functions.
- 2) Simplify rational expressions.
- 3) Simplify radical expressions.
- 4) Simplify expressions involving exponents.
- 5) Utilize rules of logarithms.
- 6) Factor polynomial expressions and solve all types of polynomial equations.
- 7) Find missing sides of a right triangle.
- 8) Evaluate trigonometric functions.
- 9) Identify, graph and transform parent functions. Find domain and range.
- 10) Write the equation of a line.

Problem Sets:

Work on a separate sheet of paper. Clearly label the problem set and show all work. Box your solutions. Each problem set should be worked on a separate sheet of paper.

Tutorials over topics may be found at <http://www.khanacademy.org>.

I. Evaluate functions

- Given $f(x) = x^2 - 3x + 4$, determine each of the following:
 - $f(-3)$
 - $\frac{f(7) - f(5)}{7 - 5}$
 - $f(c)$
 - $f(x+h)$
- Given $g(x) = \begin{cases} 2x - 5 & \text{for } x < 2 \\ 3 - x & \text{for } x \geq 2 \end{cases}$, determine each of the following:
 - $g(0)$
 - $g(7)$
 - $g(2)$

II. Simplify Rational Expressions

- Add: $\frac{x}{x-3} + \frac{x+7}{x^2-9}$
- Subtract: $\frac{\cos x}{1-\sin x} - \frac{\cos x}{1+\sin x}$
- Simplify: $\frac{x + \frac{x}{3}}{x - \frac{x}{6}}$
- Simplify: $\frac{\frac{1}{x+6} - \frac{1}{6}}{x}$
- Rationalize: $\frac{5}{3+\sqrt{x}}$

III. Simplify Expressions Involving Radicals

1. $\frac{12}{\sqrt{20}}$

2. $\sqrt[4]{64x^{13}y^9}$

3. $7\sqrt{72} + 3\sqrt{98}$

4. $(5\sqrt{3} + 6\sqrt{7})(3\sqrt{3} - 2\sqrt{7})$

5. $\frac{4\sqrt{2}}{5} - \frac{3\sqrt{3}}{\sqrt{5}}$

6. $\frac{4 + \sqrt{2}}{5 - \sqrt{2}}$

7. $\frac{3 - \frac{\sqrt{3}}{2}}{7 + \frac{\sqrt{3}}{2}}$

IV. Simplify Expressions Involving Exponents

1. $\left(\frac{-9a^2b^2}{3ab}\right)^3 \left(\frac{25a^2b^4}{-5}\right)^{-2}$

2. $\frac{x^{\frac{1}{2}} \left(2x^{\frac{1}{2}} - 3x^{\frac{-3}{2}}\right)}{6x^{-2}}$

3. $\sqrt{\frac{16^x \cdot 2^6}{8^{-10x}}}$

4. $\frac{2^{-1}}{2^{-2} + 2^{-3}}$

5. $\left(9x^{-6}\right)^{\frac{-3}{2}}$

V. Utilize Rules of Logarithms

1. Write as a single logarithm: $\log_3 5 + 6 \log_3 x$
2. Expand to write as a sum/difference of logarithms: $\log_7 \frac{3x^2}{y}$
3. Solve for x: $\log_4 x + \log_4 3 = 2$
4. Solve for x: $\log_4 x + \log_4 3 = \log_4 2$
5. Solve for x: $3^x = 27^{x-1}$
6. Solve for x: $5^{x-1} = 7$
7. The Natural Base, e , is which of the following?
 - A. a variable
 - B. a constant
 - C. the ratio of the circumference of a circle to its diameter
 - D. an imaginary number
8. Solve for x: $e^x = 10$

VI. Factor Polynomial Expressions and Solve Equations

1. **Factor:** $3x^4y + 9x^2y$
2. **Factor:** $x^{100} - x^{96}$
3. **Factor:** $(x + 6)^3 + 2(x + 6)^4$
4. **Factor:** $6x^2 + x - 15$
5. **Factor:** $27 + 3x - 2x^2$
6. **Factor:** $8x^3 + 125y^3$
7. **Factor:** $x^6 - y^6$

Solve each equation.

8. $x^2 + 20 = 9x$
9. $18x^2 = 6x$
10. $4x^2 + 4x = 3$
11. $8x^2 = 26x + 15 = 0$
12. $6x^3 - x^2 + 17 = 2x^2 + 47$

Use factoring and synthetic division to find all zeros without using a calculator.

13. $f(x) = 2x^4 + 3x^3 + 7x^2 - 7x - 5$
14. Given $3 + i$ is a zero of $f(x) = x^3 - 8x^2 + 22x - 20$, find the other roots.

Find zeros using a calculator.

15. $f(x) = 15x^3 - x^2 - 114x + 72$
16. $f(x) = 2x^4 + x^3 - 17x^2 - 4x + 6$

Solve inequalities.

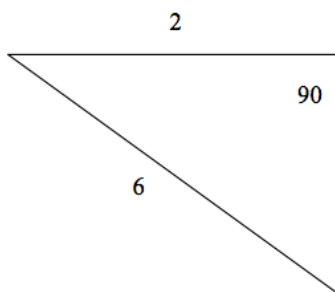
17. Solve: $2x^3 - x \leq -x^2$

18. Solve: $\frac{1}{x-3} \leq \frac{9}{4x+3}$

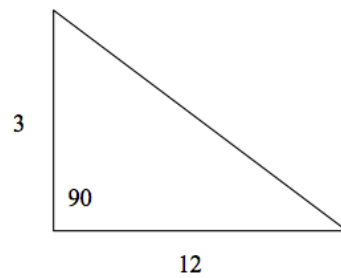
VII. Find missing sides of right triangles.

Find the missing sides of the following triangles.

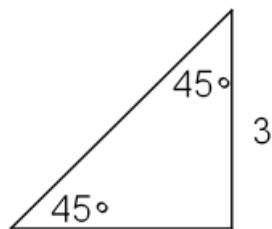
1.



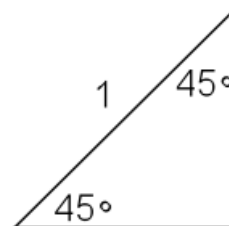
2.



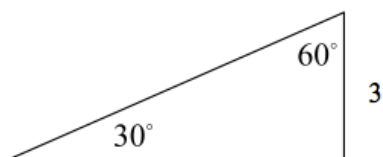
3.



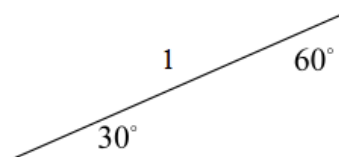
4.



5.



6.



VIII. Evaluate Trig Functions

(The following problems should be worked *without* a calculator.)

1. Determine the other five trigonometric functions for an angle in the first quadrant given $\sin \theta = \frac{5}{13}$.
2. Evaluate: $\cos \pi$
3. Evaluate: $\sin \frac{4\pi}{3}$
4. Evaluate: $\sec \frac{3\pi}{4}$
5. Evaluate: $\tan \frac{3\pi}{2}$
6. Determine the quadrant where $\cos \theta > 0$ and $\sin \theta < 0$.
7. Determine the quadrant where $\tan \theta > 0$ and $\sec \theta < 0$.
8. Evaluate: $\arcsin \frac{\sqrt{3}}{2}$
9. Evaluate: $\arccos \frac{-1}{\sqrt{2}}$
10. Solve for θ : $\sin \theta = \frac{1}{2}$ for $0 \leq \theta < 2\pi$
11. Solve for θ : $\cos \theta = 0$ for $0 \leq \theta < 2\pi$
12. Solve for θ : $2 \sin \theta = -\sqrt{3}$ for $0 \leq \theta < 2\pi$

IX. Parent Functions – Domain and Range

One of the things we do in calculus is study the behavior of functions. You should be able to recognize and graph the following parent functions without the use of a calculator.

Graph each of the functions listed below on graph paper. Identify the function's domain and range.

1) $y = x$

2) $y = |x|$

3) $y = x^2$

4) $y = x^3$

5) $y = \frac{1}{x}$

6) $y = \sqrt{x}$

7) $y = \ln x$

8) $y = e^x$

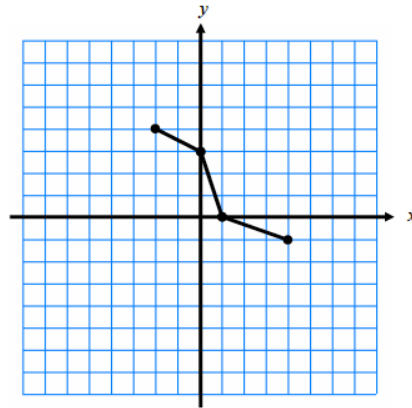
9) $y = \sin x$

10) $y = \cos x$

11) $y = \tan x$

12) You should also be able to graph transformations of the functions above. Given $f(x)$; what effect do a , b , c and d have on the function: $a f[b(x + c)] + d$?

- 13) Given the graph of f shown below, graph the following transformations on graph paper.



- a) $f(x) + 2$
- b) $f(x + 3)$
- c) $-f(x)$
- d) $f(-x)$
- e) $f|x|$
- f) $2f(x)$
- g) $f(1/2x)$
- h) $f(x - 1) + 3$
- i) $-2f(x + 1) - 4$

X. Write the equation of a line

1. Write the equation of a line with slope $\frac{4}{5}$ that passes through $(-5, 2)$.
2. Write the equation of a line that passes through $(4, 3)$ and $(-2, 1)$.
3. Write the equation of the line perpendicular to $y = 2x - 3$ and through $(1, -2)$.