

**Summer Math Packet:  
Incoming Calculus I\* students**

*Directions:* One of the most challenging aspects of Calculus is that it requires you to use content from all your previous math courses. You will be better prepared to handle the rigors of the course, if you close any gaps you have in these topics. This packet contains review problems from your most recent math class and represents the types of mathematics knowledge your Calculus teacher expects you to have. This packet should be completed in its entirety and you will be assessed on this content early in the course. **Please complete your work on a separate piece of paper**, clearly labeled with the problem number. If asked to graph, use graph paper. All of these problems should be done using pencil or pen and paper – **note that some problems expect you to not use a calculator in your solution.** We will be reviewing these problems on the first day of school. By review, our intentions are to provide the correct answers to the packet with some explanation provided as well. It is not our intention to re-teach any of the concepts present on the packet. If re-teaching is needed, it is your responsibility to have that taken care of before coming to school on the first day.

A diagnostic quiz will be given some time during that first week to assess the skills and knowledge addressed in the packet. **You will not be allowed to use a calculator the entire quiz.**

Should you run into difficulty with any of these problems as you are completing the packet, check out the website(s) below. It might help refresh your memory.

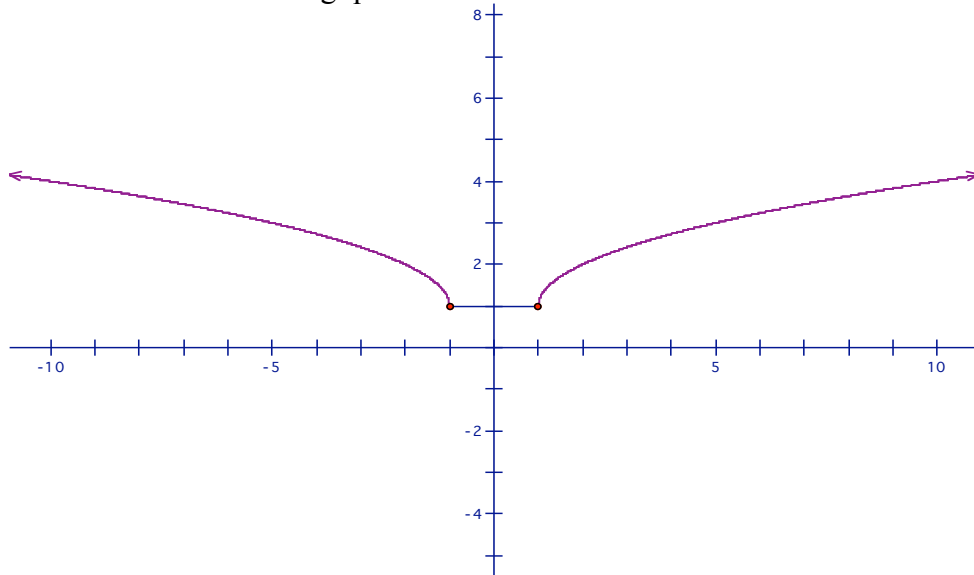
<http://hotmath.com/>

<http://www.khanacademy.org>

When you are working on these problems, circle the ones that you have trouble with. These are the problems that you will need to review carefully when you prepare for the quiz on this material at the beginning of the school year.

For all Problems/Questions, it is assumed that all work is shown and no calculators are used.

1. Answer the following questions about the function below.



- What linear function does this piecewise function follow on the domain  $[-1,1]$ ? What is the slope of this function?
- Find  $f(0)$ ,  $f(-0.999)$ .
- Approximate  $f(1.5)$  and  $f(-6)$ .
- Give two approximations, one positive and one negative, for  $x$  when  $f(x)=3$ .
- Give the range of this piecewise function.
- If  $f'(x)$  represents a function that describes the rate of change(slope) of  $f$  at any given point on  $f$ , estimate the value of each of the following:  $f'(-2)$ ,  $f'(2)$ ,  $f'(0.4)$
- We say that  $f'(-1)$  and  $f'(1)$  are both undefined. Why do you think this is the case?

2. Graph the following piecewise function:

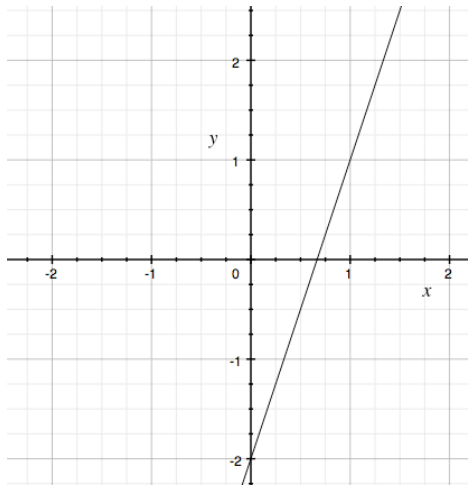
$$f(x) = \begin{cases} 2, & x \leq -1 \\ |x|, & -1 < x < 1 \\ -x, & x \geq 1 \end{cases}$$

If you are not sure what a piecewise function is, please look it up.

3. Given  $f(x) = 3 - x^2$ , find and simplify the following. Do not use a calculator.

- $f(0)$
- $f(\sqrt{3})$
- $f(t-1)$

4. Find the equation of this line.



5. Simplify the following. Show all work.

a.  $x^{\frac{3}{4}}x^{\frac{1}{2}}$

b.  $\frac{4x^{\frac{3}{2}}}{x}$

6. Rationalize the denominator. Show all work.

a.  $\frac{5}{2\sqrt{x}}$

b.  $\frac{3+x}{1-\sqrt{x}}$

7. Rationalize the numerator:  $\frac{x\sqrt{x+2}}{4}$

8. Find the zero(s) of the following equations algebraically

a.  $f(x) = 6x^2 - 5x - 6$

b.  $4x^3 - 16x = g(x)$

9. Simplify each expression.

a.  $\frac{1}{x} + \frac{3}{2x}$

b.  $\frac{2x^2}{3x} \cdot \frac{4\sqrt{x}}{15}$

c.  $\frac{\sqrt[3]{x}}{2} \div \frac{x^{\frac{2}{3}}}{6}$

d.  $\frac{\frac{3}{x^2} + \frac{2}{3x}}{\frac{4}{2x} + \frac{2}{3x^2}}$

e.  $\frac{7t^{\frac{4}{3}}}{3} + \frac{4}{3t^{\frac{2}{3}}}$

10. Find the domain and range of the following functions.

a.  $f(x) = 4 - x$

b.  $g(x) = \frac{4}{x}$

c.  $h(x) = \sqrt{1 - x}$

d.  $j(x) = 2 \sin \pi t$

11. Sketch the following, showing important features like minimums, maximums, intercepts, asymptotes, endpoints, etc.

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

b.  $g(x) = 2x^2 - 3$

c.  $j(x) = \sqrt{x - 2}$

d.  $k(x) = \sin x + 1$

12. Find all values of  $\theta$ , if  $\theta$  is in the interval  $[0, 2\pi)$  and  $\theta$  has the given function value.

a.  $\sin \theta = -\frac{1}{2}$

b.  $\cos \theta = -\frac{1}{2}$

13. Solve  $81 = b^{\frac{4}{3}}$ .

14. Solve  $x = \log_5 \sqrt[4]{25}$

15. Solve the following equations:

a.  $\log_2(x+2) + \log_2 5 = 4$

b.  $4^{x-2} = \left(\frac{1}{32}\right)^{(2x+3)}$

16. Solve  $10^{2x+4} = \left(\frac{1}{100}\right)^{x-3}$

17. Factor completely:  $x^4 - 13x^2 + 36$

18. Expand completely:  $(2x-3)^3$

19. Write without radicals (use fractional/negative exponents):

a.  $\sqrt[3]{\cos^3 x}$

b.  $\frac{3}{4\sqrt{\sin x}}$

20. Write in the form  $ax^n$  where a and n are constants

a.  $\sqrt[7]{x^3}$

b.  $\frac{2}{3\sqrt{x}}$

c.  $\frac{15}{5x^4}$

21. Copy and fill in the following table, without the use of a calculator or notes.

$\theta$ (Radians)	$\pi/6$	$\pi/4$	$\pi/3$	$\pi/2$			$\pi$			$3\pi/2$	
$\theta$ (Degrees)					120	150		225	240		330
Sine											
Cosine											

22. If  $\theta$  is a second quadrant angle and  $\sin \theta = \frac{24}{25}$ , find the other five trigonometric functions.

23. Solve the following for  $\theta$ :  $0 \leq \theta < 2\pi$

a.  $\sin \theta \cos \theta = \sin \theta$

b.  $4 \sin \theta = \csc \theta$

c.  $\sqrt{2} \sin \theta - 1 = 0$

d.  $2 \sin x + 6 = 7$