

AP Calc AB

If your student is taking Honors Geometry, Honors Algebra 2, Precalculus or AP Calculus AB, he or she will need to work on a packet of review material over the summer.

The problems are review materials from the previous class taken.

**We recommend that your student organizes the work for the packet in a spiral notebook or loose leaf paper stapled together.**

When your student finishes the packet, please sign this sheet of paper.

Your student will need to return this sheet and the packet to his or her teacher at the beginning of the 2019-2020 school year. His or her teacher will have a few days for your child to ask questions and then there may be a test (without a calculator) over the material during the first week of school.

Packets are also at the front office and online on FHHS website on math page.

Student Name \_\_\_\_\_

Student  
Signature \_\_\_\_\_ Date \_\_\_\_\_

Parent Name \_\_\_\_\_

Parent  
Signature \_\_\_\_\_ Date \_\_\_\_\_



## AP Calculus AB Summer Packet

## Multiple Choice

Identify the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 1. Which of the following represents  $1 < x \leq 6$ ?
- a.  $[1, 6)$       b.  $[1, 6]$       c.  $(1, 6)$       d.  $(1, 6]$
- \_\_\_\_\_ 2. Determine the  $x$ -intercepts and the vertex of the graph of the quadratic function  $f(x) = x^2 + 11x + 30$ .
- a. The  $x$ -intercepts are 5 and  $-6$ . Vertex is  $(0, -0.25)$ .  
b. The  $x$ -intercepts are  $-5$  and  $-6$ . Vertex is  $(-5.5, -0.25)$ .  
c. The  $x$ -intercepts are 6 and  $-6$ . Vertex is  $(-5.5, 0)$ .  
d. The  $x$ -intercepts are 6 and  $-5$ . Vertex is  $(-5.5, -0.5)$ .
- \_\_\_\_\_ 3.  $\theta$  is an angle in standard position with point  $P(-4, 2)$  on the terminal side. Which statement is *not* correct?
- a.  $\sec \theta = -\frac{\sqrt{5}}{2}$       b.  $\cot \theta = -2$       c.  $\sin \theta = \frac{\sqrt{5}}{5}$       d.  $\cos \theta = \frac{\sqrt{5}}{5}$
- \_\_\_\_\_ 4. What are the values of  $\sin \theta$  and  $\cos \theta$  for the acute angle  $\theta$  in standard position if  $\tan \theta = \frac{1}{3\sqrt{11}}$ ?
- a.  $\sin \theta = 10, \cos \theta = \frac{10}{3\sqrt{11}}$       c.  $\sin \theta = \frac{1}{10}, \cos \theta = \frac{3\sqrt{11}}{10}$   
b.  $\sin \theta = \frac{3\sqrt{11}}{10}, \cos \theta = \frac{1}{10}$       d.  $\sin \theta = \frac{1}{10}, \cos \theta = \frac{10}{3\sqrt{11}}$
- \_\_\_\_\_ 5. Find the exact value of  $\ln e^6$ .
- a. 6      b.  $\frac{1}{6}$       c.  $6e$       d.  $\frac{1}{6e}$
- \_\_\_\_\_ 6. Find all the complex zeros of the polynomial function  $f(x) = x^4 + 4x^3 + 4x^2 - 4x - 5$ .
- a.  $1, -1, -1 + 2i, -1 - 2i$       c.  $1, -1, -2 - 2i, -2 + 2i$   
b.  $1, -1, 1 - 2i, 1 + 2i$       d.  $1, -1, -2 - i, -2 + i$

7. The population of a once-endangered animal species has been increasing. From the data in the table, use a graphing calculator to find a linear equation that describes the relationship between  $t$  and  $\log P$ . Then find an exponential relationship between  $t$  and  $P$ .

Year ( $t$ )	Population ( $P$ )	$\log P$
1	388	2.589
2	406	2.609
3	538	2.731
4	1650	3.217
5	2440	3.387
6	3740	3.573

- a. linear:  $\log P = 0.221t + 2.24$   
 exponential:  $P = 175.1(1.66)^t$
- b. linear:  $\log P = 175.1t + 1.66$   
 exponential:  $P = 0.221(2.24)^t$
- c. linear:  $\log P = 388t + 3740$   
 exponential:  $P = 2.589(3.573)^t$
- d. linear:  $\log P = 2.24t + 0.221$   
 exponential:  $P = 1.66(175.1)^t$

8. Perform the indicated operation and write the result in the form  $a + bi$ .

$$2i(4i - 6) + 5(2 - 5i)$$

- a.  $2 - 37i$       b.  $-2 + 13i$       c.  $2 + 33i$       d.  $-18 + 13i$

9. Which is the solution to  $4^x = 7^{x-3}$ ?

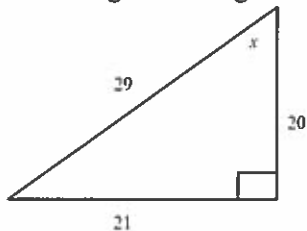
- a. 7      b. 5.2158      c. -1.7519      d. 10.4317

10. Determine the domain of the function.

$$h(x) = \frac{9x}{x(x^2 - 16)}$$

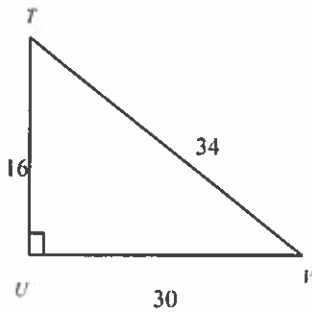
- a. All real numbers except  $\pm 4$ .  
 b. All real numbers except 4.  
 c. All real numbers except  $\pm 4$  and 0.  
 d. All real numbers except  $\pm 16$ .

11. Solve for  $x$  in the given triangle to the nearest degree.



- a.  $56^\circ$       b.  $46^\circ$       c.  $36^\circ$       d.  $58^\circ$

- \_\_\_\_\_ 12. If \$9500 is invested at an interest rate of 7%, compounded continuously, determine the balance in the account after 4 years. Use the formula  $A = Pe^{rt}$ .
- a. \$12569.73      b. \$12452.56      c. \$70196.03      d. \$13481.14
- \_\_\_\_\_ 13. Evaluate the expression  $\tan\left(\frac{253\pi}{4}\right)$ .
- a.  $\frac{\sqrt{2}}{2}$       b.  $-\frac{\sqrt{2}}{2}$       c.  $-1$       d.  $1$
- \_\_\_\_\_ 14. Which is  $3 \log x - 5 \log(x-2)$  written as a single logarithm?
- a.  $\log x^3(x-2)^5$       b.  $15 \log \frac{x}{x-2}$       c.  $\log \frac{x^3}{(x-2)^5}$       d.  $\log x(x^3-2)^5$
- \_\_\_\_\_ 15. Find all real solutions of the equation  $\sqrt{x^2 + 9x + 18} = 2$ .
- a.  $x = 2$  or  $-7$       b.  $x = -2$  or  $-7$       c.  $x = 7$  or  $2$       d.  $x = -2$  or  $7$
- \_\_\_\_\_ 16. Find the sine, cosine, and tangent of  $\angle T$ .



- a.  $\frac{15}{17}, \frac{8}{15}, \frac{8}{17}$       b.  $\frac{8}{15}, \frac{8}{17}, \frac{15}{17}$       c.  $\frac{17}{15}, \frac{15}{8}, \frac{17}{8}$       d.  $\frac{15}{17}, \frac{8}{17}, \frac{15}{8}$
- \_\_\_\_\_ 17. Which is  $5 \log x + 3 \log(x+2)$  written as a single logarithm?
- a.  $\log x^5(x+2)^3$       b.  $15 \log x(x+2)^3$       c.  $\log x(x+2)$       d.  $15 \log x(x+2)$
- \_\_\_\_\_ 18. Find  $\cot \theta$  if  $(8, 15)$  is a point on the terminal side of  $\theta$ .
- a.  $\frac{8}{17}$       b.  $\frac{8}{15}$       c.  $\frac{15}{17}$       d.  $\frac{15}{8}$

- \_\_\_\_\_ 19. Which is the rationalized form of the expression  $\frac{\sqrt{x}}{\sqrt{x}-\sqrt{3}}$ ?
- a.  $-\frac{\sqrt{3x}}{3}$       b.  $\frac{x-\sqrt{3x}}{x-3}$       c.  $\frac{x+\sqrt{3x}}{x-3}$       d.  $\frac{x}{x-3}$
- \_\_\_\_\_ 20. Find the inverse of the function  $f(x) = \{(14, 27), (3, 11), (15, -7)\}$ .
- a.  $\{(11, 14), (15, 3), (27, -7)\}$       b.  $\{(27, 14), (11, 3), (-7, 15)\}$
- \_\_\_\_\_ 21. Given  $f(x) = x^3$  and  $g(x) = 1 - 5x^2$ , find  $(f \circ g)(x)$  and its domain.
- a.  $(1 - 5x^3), x \neq \sqrt[3]{-3}$   
 b.  $(1 - 5x^2)^3$ , all real numbers
- \_\_\_\_\_ 22. A tree casts a shadow of 25 meters when the angle of elevation of the sun is  $22^\circ$ . Find the height of the tree to the nearest meter.
- a. 10 m      b. 23 m      c. 234 m      d. 12 m
- \_\_\_\_\_ 23. Use the  $x$ -intercept method to find all real solutions of the equation.  
 $x^3 - 8x^2 + 17x - 10 = 0$
- a.  $x = 1, 2, \text{ or } -5$       c.  $x = -1, -2, \text{ or } 5$   
 b.  $x = -1, -2, \text{ or } -5$       d.  $x = 1, 2, \text{ or } 5$
- \_\_\_\_\_ 24. For the function  $f(x) = \sqrt{x-4}$ , find
- a.  $f(6)$ .  
 b.  $f(-a)$ .
- a. a.  $\sqrt{2}$       b. a.  $\sqrt{4}$       c. a.  $\sqrt{2}$       d. a.  $\sqrt{4}$   
 b.  $\sqrt{-a-4}$       b.  $\sqrt{-a+4}$       b.  $\sqrt{-a+4}$       b.  $\sqrt{-a-4}$
- \_\_\_\_\_ 25. The number of bacteria present in a culture after  $t$  minutes is given as  $B = 1000 e^{kt}$ , where  $k$  is a constant. If there are 8449 bacteria present after 11 minutes, find  $k$ .
- a. 0.194      b. 0.213      c. 23.474      d. 2.134
- \_\_\_\_\_ 26. Solve the equation.  
 $6x = 2x^2 + 1$
- a.  $x = \frac{3+\sqrt{7}}{4}$  or  $\frac{3-\sqrt{7}}{4}$       c.  $x = \frac{-3+\sqrt{7}}{4}$  or  $\frac{3-\sqrt{7}}{4}$   
 b.  $x = \frac{3+\sqrt{7}}{2}$  or  $\frac{3-\sqrt{7}}{2}$       d.  $x = \frac{-3+\sqrt{7}}{2}$  or  $\frac{3-\sqrt{7}}{2}$

## summer packet calc

## Multiple Choice

Identify the choice that best completes the statement or answers the question.

- \_\_\_\_\_ 1. Find  $\cot \theta$  if  $(8, 15)$  is a point on the terminal side of  $\theta$ .  
A.  $\frac{15}{17}$       B.  $\frac{8}{17}$       C.  $\frac{8}{15}$       D.  $\frac{15}{8}$
- \_\_\_\_\_ 2. Evaluate the expression  $\cos\left(\frac{7}{4}\pi\right)$ .  
F.  $\frac{\sqrt{2}}{2}$       G.  $-\frac{\sqrt{2}}{2}$       H. 0      I. -1
- \_\_\_\_\_ 3. Evaluate the expression  $\tan\left(-\frac{257\pi}{4}\right)$ .  
A. -1      B.  $-\frac{\sqrt{2}}{2}$       C. 1      D.  $\frac{\sqrt{2}}{2}$
- \_\_\_\_\_ 4. Which single expression is equivalent to  $\sin(\theta + \pi)$ ?  
F.  $\cos \theta$       G.  $\sin \theta$       H.  $-\sin \theta$       I.  $-\cos \theta$
- \_\_\_\_\_ 5. Use the given facts about the functions to find the indicated limit.  
 $\lim_{x \rightarrow 2} \sqrt{x^2 + 2x + 1}$   
A. 3      B. 2      C. 11      D. 9
- \_\_\_\_\_ 6. Find the limit, if it exists.  
 $\lim_{x \rightarrow 2} (2x^3 + x^2 + 7)$   
F. 16      G. 27      H. 4      I. None of these
- \_\_\_\_\_ 7. Use the properties of limits to find the limit.  
 $\lim_{x \rightarrow \infty} \left(\frac{5x}{x-2} + \frac{7x}{x^2+2}\right)$   
A. 4      B. 5      C. 8      D. None of these
- \_\_\_\_\_ 8. Use the limit theorem and the properties of limits to find the limit.  
 $\lim_{x \rightarrow \infty} \frac{-7x^3 + 4x + 1}{-7x^2 - 9x + 3}$   
F.  $\frac{1}{3}$       G.  $\infty$       H. 1      I.  $-\infty$
- \_\_\_\_\_ 9. Convert  $\frac{17\pi}{10}$  from radians to degrees.  
A.  $366^\circ$       B.  $306^\circ$       C.  $279^\circ$       D.  $252^\circ$
- \_\_\_\_\_ 10. Convert  $-35^\circ$  to radians.  
F.  $\frac{-35}{\pi}$       G.  $-35\pi$       H.  $\frac{-7\pi}{36}$       I.  $\frac{-7\pi}{72}$

- \_\_\_\_\_ 11. Use the unit circle to find the exact value of the trigonometric function  $\cos 30^\circ$ .  
 A.  $-1$                       B.  $\frac{\sqrt{3}}{2}$                       C.  $\frac{1}{2}$                       D.  $\frac{\sqrt{2}}{2}$
- \_\_\_\_\_ 12. Use the unit circle to find the exact value of the trigonometric function  $\cos 210^\circ$ .  
 F.  $-\frac{1}{2}$                       G.  $\frac{\sqrt{2}}{2}$                       H.  $-1$                       I.  $-\frac{\sqrt{3}}{2}$
- \_\_\_\_\_ 13. Use the unit circle to find the exact value of the trigonometric function  $\cos 330^\circ$ .  
 A.  $\frac{\sqrt{2}}{2}$                       B.  $\frac{\sqrt{3}}{2}$                       C.  $-1$                       D.  $-\frac{1}{2}$
- \_\_\_\_\_ 14. Use the unit circle to find the exact value of the trigonometric function  $\cos 150^\circ$ .  
 F.  $\frac{\sqrt{2}}{2}$                       G.  $\frac{1}{2}$                       H.  $-\frac{\sqrt{3}}{2}$                       I.  $-1$
- \_\_\_\_\_ 15. Use the unit circle to find the exact value of  $\cos 45^\circ$ .  
 A.  $\sqrt{2}$                       B.  $\frac{\sqrt{2}}{2}$                       C.  $\frac{1}{2}$                       D.  $-\frac{\sqrt{2}}{2}$
- \_\_\_\_\_ 16. Use the unit circle to find the exact value of  $\cos 30^\circ$ .  
 F.  $\frac{1}{2}$                       G.  $\frac{\sqrt{3}}{2}$                       H.  $-\frac{\sqrt{3}}{2}$                       I.  $\sqrt{3}$
- \_\_\_\_\_ 17. Use the unit circle to find the exact value of  $\sin 315^\circ$ .  
 A.  $-\frac{\sqrt{2}}{2}$                       B.  $\frac{\sqrt{2}}{2}$                       C.  $-\sqrt{2}$                       D.  $-\frac{1}{2}$
- \_\_\_\_\_ 18. Use the unit circle to find the exact value of  $\cos 330^\circ$ .  
 F.  $\frac{1}{2}$                       G.  $\frac{\sqrt{3}}{2}$                       H.  $-\frac{\sqrt{3}}{2}$                       I.  $\sqrt{3}$
- \_\_\_\_\_ 19. Use the unit circle to find the exact value of  $\cos 150^\circ$ .  
 A.  $-\frac{1}{2}$                       B.  $\frac{\sqrt{3}}{2}$                       C.  $-\sqrt{3}$                       D.  $-\frac{\sqrt{3}}{2}$
- \_\_\_\_\_ 20. Use the unit circle to find the exact value of  $\cos 135^\circ$ .  
 F.  $\frac{\sqrt{2}}{2}$                       G.  $-\frac{\sqrt{2}}{2}$                       H.  $-\frac{1}{2}$                       I.  $-\sqrt{2}$

**Short Answer**

- Express  $\cos \theta \csc \theta$  in terms of  $\tan \theta$ .
- Find the limit, if it exists. If the limit does not exist, explain why.

$$\lim_{x \rightarrow 42} \frac{\sqrt{x+7} - 7}{x - 42}$$

- Use the limit theorem and the properties of limits to find the limit.

$$\lim_{x \rightarrow \infty} \frac{\sqrt{16x^2 - 5}}{4x - 5}$$



## Identities:

trig

$$\sin \theta = \frac{1}{\csc \theta}$$

$$\cos \theta = \frac{1}{\sec \theta}$$

$$\csc \theta = \frac{1}{\sin \theta}$$

$$\sec \theta = \frac{1}{\cos \theta}$$

$$\tan \theta = \frac{\sin \theta}{\cos \theta}$$

$$\cot \theta = \frac{\cos \theta}{\sin \theta}$$

$$\tan \theta = \frac{1}{\cot \theta}$$

$$\cot \theta = \frac{1}{\tan \theta}$$

## Pythagorean:

$$\sin^2 x + \cos^2 x = 1$$

$$\sin^2 x = 1 - \cos^2 x$$

$$\cos^2 x = 1 - \sin^2 x$$

$$\sec^2 x = \tan^2 x + 1$$

$$\sec^2 x - 1 = \tan^2 x$$

$$\sec^2 x - \tan^2 x = 1$$

$$\csc^2 x = \cot^2 x + 1$$

$$\csc^2 x - 1 = \cot^2 x$$

$$\csc^2 x - \cot^2 x = 1$$

now practice:

$$\sin^2 x + \cos^2 x = 1$$

$$\textcircled{4} \sec^2 x = \tan^2 x + 1 \quad \textcircled{7} \csc^2 x = \cot^2 x + 1$$

⑤

⑧

⑥

⑨

## double Angle

$$\sin 2x = 2 \sin x \cos x$$

$$\cos 2x = \cos^2 x - \sin^2 x$$

$$\cos 2x = 2 \cos^2 x - 1$$

$$\cos 2x = 1 - 2 \sin^2 x$$

$$\tan 2x = \frac{2 \tan x}{1 - \tan^2 x}$$

comes from

$$\cos^2 x - \sin^2 x$$

$$\cos^2 x - (1 - \cos^2 x)$$

$$\cos^2 x - 1 + \cos^2 x$$

$$2 \cos^2 x - 1$$

comes from

$$\cos^2 x - \sin^2 x$$

$$(1 - \sin^2 x) - \sin^2 x$$

Pythagorean Identity

$$1 - 2 \sin^2 x$$

practice:  $\cos 2x =$  \_\_\_\_\_

$\cos 2x =$  \_\_\_\_\_  $\tan 2x =$  \_\_\_\_\_

$\sin 2x =$  \_\_\_\_\_  $\cos 2x =$  \_\_\_\_\_

You must memorize The Unit Circle:

$$x^2 + y^2 = 1$$

$$\cos^2 x + \sin^2 x = 1$$

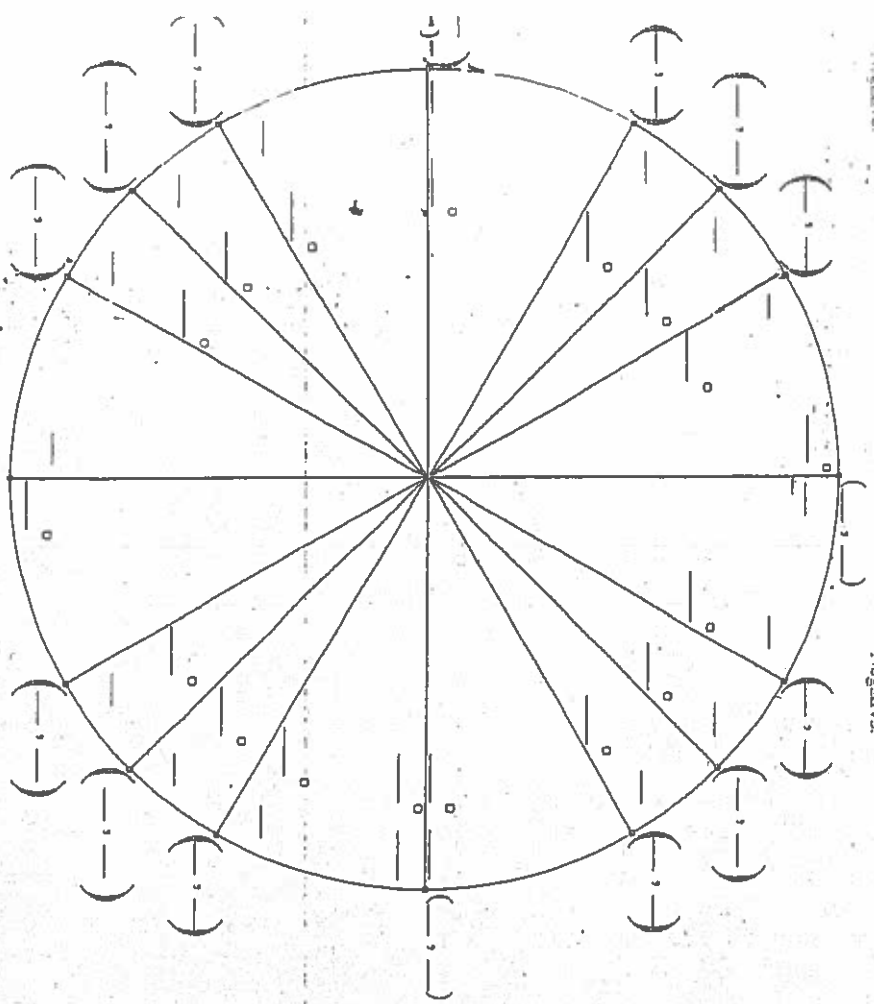
$$\cos \theta = x$$

$$\sin \theta = y$$

$$\tan \theta = \frac{y}{x}$$

Fill in The Unit Circle

Fill in The Unit Circle

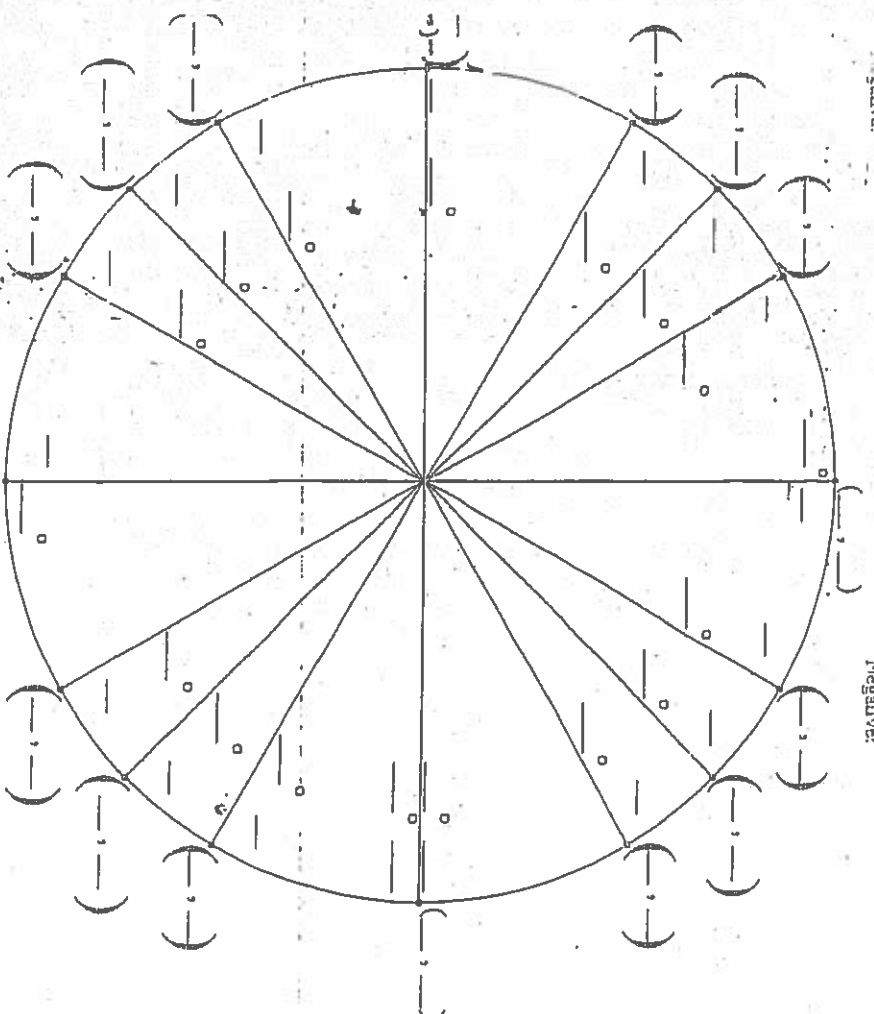


Positive:  
Negative:

Positive:  
Negative:

Positive:  
Negative:

Positive:  
Negative:



Positive:  
Negative:

Positive:  
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Positive:  
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