Name _____ Date _____

Simplifying Logarithms

product property: $\log_b (m \cdot n) = \log_b m + \log_b n$

quotient property: $\log_b \left(\frac{m}{n}\right) = \log_b m - \log_b n$

power property: $\log_b (m^n) = n \cdot \log_b m$

Simplify.

Example 1: $\log_5 6 + \log_5 8 = \log_5 (6 \cdot 8) = \log_5 48$

Example 2: $\log_7 9 - \log_7 3 = \log_7 \frac{9}{3} = \log_7 3$

Example 3: $\log_{12} 6^3 = 3 \log_{12} 6$

1. $\log_9 4 + \log_9 6$

   $\log_9 4(6) = \log_9 24$

2. $\log_{12} 12 + \log_{12} 11$

   $\log_{12} 12(11) = \log_{12} 132$

3. $\log_{16} 36 - \log_{16} 12$

   $\log_{16} \frac{36}{12} = \log_{16} 3$

4. $\log 3 - \log 2$

   $\log\left(\frac{3}{2}\right)$

5. $\log 14^6$

   $6 \log 14$

6. $\log_{20} 10^{16}$

   $16 \log_2 10$

7. $\log_3 16 + \log_2 4$

   $\log_3 2^4 + \log_2 2^2$

   $4 \log_3 2 + 2 \log_2 2 = 1$

   $4 \log_3 2 + 2$

8. $\log 10 + \log 10$

   $\log 10(10)$

   $\log 100$

   $= \log 10^2 = 2 \log 10 = 2$

9. $\log 125$

   $\log 5^3$

   $= 3 \log 5$

10. $\log_2 2^4$

    $4 \log_2 2 = 4$

WHAT DO YOU CALL A LAWYER WHO WORKS WEEKENDS AS A LUMBERJACK AND EVENINGS IN A JAZZ CLUB?

Laws of $\log(ab) = \log(a) + \log(b)$ $\quad \log\frac{a}{b} = \log(a) - \log(b)$ $\quad \log(a^n) = n\log(a)$ Logarithms

Match each logarithmic expression with a correct expanded form.

1) $\log(xy)$ G	2) $\log(x+y)$ O	3) $\log(x^2y)$ E $2\log x + \log y$	4) $\log(xy)^2 = 2\log xy$ A
5) $\log\frac{x}{y}$ K	6) $\log(\sqrt{xy}) = \log(xy)^{\frac{1}{2}} = \frac{1}{2}\log xy$ H	7) $\log(2x\sqrt{y})$ I	8) $\log\frac{x^2}{2y}$ L

Expanded Form

A. $2\log(x) + 2\log(y)$	E. $2\log(x) + \log(y)$
H. $\frac{1}{2}\log(x) + \frac{1}{2}\log(y)$	I. $\log(2) + \log(x) + \frac{1}{2}\log(y)$
G. $\log(x) + \log(y)$	K. $\log(x) - \log(y)$
L. $2\log(x) - (\log(2) + \log(y))$	M. $\log(y) - \log(x)$
N. $2\log(x) - \log(2) + \log(y)$	O. can't expand

Find the approximate value of each logarithm.
Given: **log5 ≈ 0.699**, **log2 ≈ 0.301**, and **log3 ≈0.477.**

9) $\log 4 = \log 2^2 = 2\log 2 = 2(.301)$ S	10) $\log 10 = 1$ M	11) $\log 81 = \log 3^4 = 4\log 3 = 4(.477)$ N	12) $\log\frac{1}{5} = \log 5^{-1} = -\log 5$ T
13) $\log 30 = \log 5\cdot 6 = \log 5\cdot 2\cdot 3 = \log 5 + \log 2 + \log 3$ R	14) $\log\frac{2}{3} = \log 2 - \log 3 = .301 - .477$ W	15) $\log 18 = \log 2\cdot 3^2 = \log 2 + 2\log 3$ Y	16) $\log 0.6 = \log 6^{-1} = -\log 6 = -(\log 2\cdot 3) = -(\log 2 + \log 3)$ F

Value

F. –0.222	K. 1.431	M. 1.000	N. 1.908	P. –0.778	R. 1.477
S. 0.602	T. –0.699	U. 0.778	W. –0.176	Y. 1.255	Z. 0.222

A		M	A	N		W	H	O		R	E	A	L	L	Y		K	N	O	W	S		H	I	S		L	A	W	S		O	F		L	O	G	G	E	R		R	H	Y	T	H	M	S
4		10	4	11		14	6	2		13	3	4	8	8	15		5	11	2	14	9		6	7	9		8	4	14	9		2	16		8	2	1	1	3	13		13	6	15	12	6	10	9

Name _____ Date _____

Simplifying and Solving Logarithms

Simplify each expression, then solve. Place the letter of the correct answer above the problem number below.

Example 1: $\log_3 x - \log_3 4 = \log_3 12$

$\log_3 \left(\frac{x}{4}\right) = \log_3 (12)$

therefore $\frac{x}{4} = 12$

$X = 48$

Example 2: $\log_5 7 + \frac{1}{2}\log_5 4 = \log_5 x$

$\log_5 7 + \log_5 4^{\frac{1}{2}} = \log_5 x$

$\log_5 7 + \log_5 2 = \log_5 X$

$\log_5 14 = \log_5 x$

$X = 14$

1. $\log_3 x - 2\log_3 2 = 3\log_3 3$

   M. 23

   (N.) 108

   O. $6\frac{3}{4}$

$\log_3 \frac{x}{4} = \log_3 3^3$

$\frac{x}{4} = \frac{27}{1}$

2. $\log_2 x = 9$

   A. 18

   (E.) 512

   I. 81

$2^9 = 512$

3. $\log_2 128 = x$

   C. 16

   D. 64

   (E.) 7

$2^x = 128$

4. $\log_x 144 = -2$

   N. 12

   O. 72

   (P.) $\frac{1}{12}$

$x^{-2} = 144$

$\frac{1}{x^2} = \frac{144}{1}$

$144x^2 = 1$

$x^2 = \frac{1}{144}$

$x = \frac{1}{12}$

5. $\log_2 x = \frac{1}{3}\log_2 27$

   (N.) 3

   O. 9

   P. 27

$\log_2 x = \log_2 27^{1/3}$

$\log_2 x = \log_2 3$

$x = 3$

6. $\log_{16} 32 - \log_{16} 2 = x$

   W. 2

   (X.) 1

   Y. 16

$\log_{16} \frac{32}{2} = \log_{16} 16 = 1$

7. $5 \log 2 = \log x$

   E. 10

   I. 16

   (O.) 32

$\log 2^5 = \log x$

$2^5 = x$

8. $\log_2 x - \log_2 5 = \log_2 10$

   R. 25

   S. 15

   (T.) 50

$\log_2 \frac{x}{5} = \log_2 10$

$\frac{x}{5} = 10$

$x = 50$

A logarithm is an $\frac{E}{2}\ \frac{X}{6}\ \frac{P}{4}\ \frac{O}{7}\ \frac{N}{5}\ \frac{E}{3}\ \frac{N}{1}\ \frac{T}{8}$.

0-7424-1789-1 Algebra II

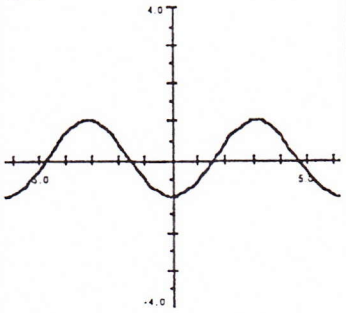
HOW IS DRIVING A HEAVILY LOADED TRUCK UPHILL LIKE GRAPHING THE FUNCTION $y = f(x) - 1$?

Match the equation of each function with one of the graphs below.

1) $y = (x + 1)^2$ N	2) $y = x^2 + 1$ E	3) $y = -x^2 + 1$ W	4) $y = (x+1)^2 + 1$ H
5) $y = \sin(x)$ I	6) $y = -\sin(x) + 1$ U	7) $y = \sin(x - \frac{\pi}{4})$ T	8) $y = -\cos(x)$ D
9) $y = 2^x$ O	10) $y = 2^{x-1}$ S	11) $y = 2^x - 1$ Y	12) $y = -2^x + 1$ F

Scale trig graphs: $-6.28 \le x \le 6.28$; $-4 \le y \le 4$ other graphs: $-4 \le x \le 4$; $-4 \le y \le 4$

D.



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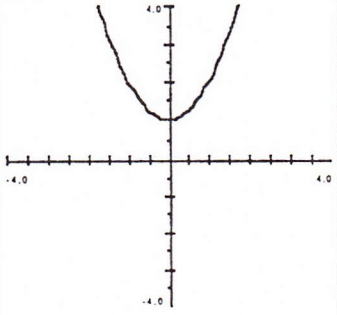

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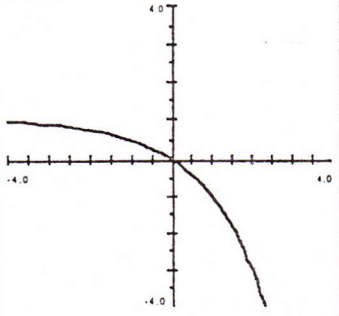

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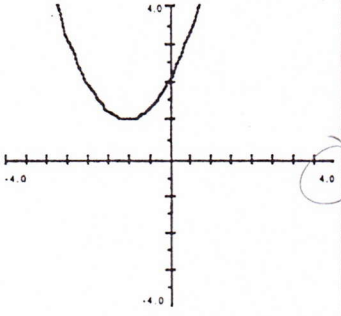

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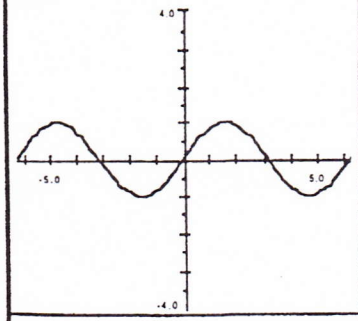

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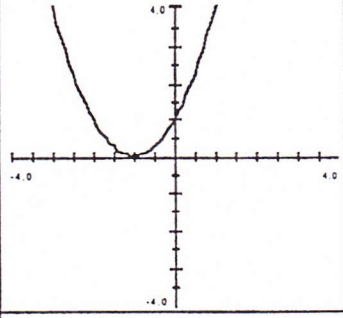

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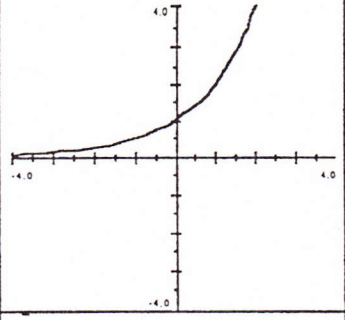

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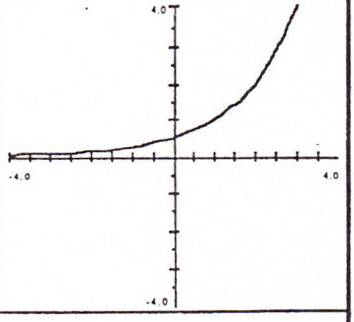

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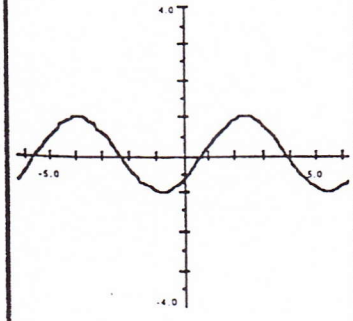
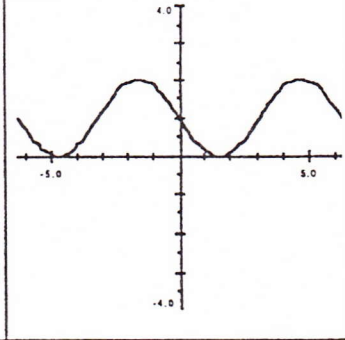


U.



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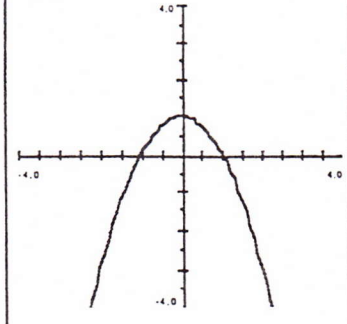
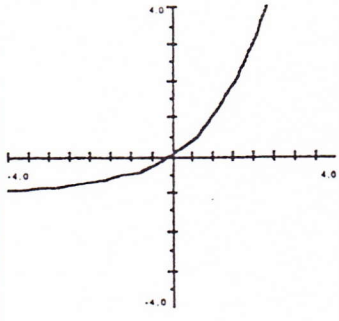
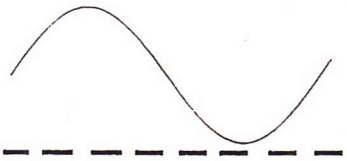


Y.



Y	O	U	N	E	E	D	T	O	D	O	W	N	S	H	I	F	T
11	9	6	1	2	2	8	7	9	8	9	3	1	10	4	5	12	7

WHAT DOES THIS PICTURE SAY?



Given: $y = A\sin(bx)$ or $y = A\cos(bx)$

The **A**mplitude of the sine or cosine wave is given by $|A|$

The **P**eriod of the sine or cosine wave is given by $\frac{2\pi}{|b|}$

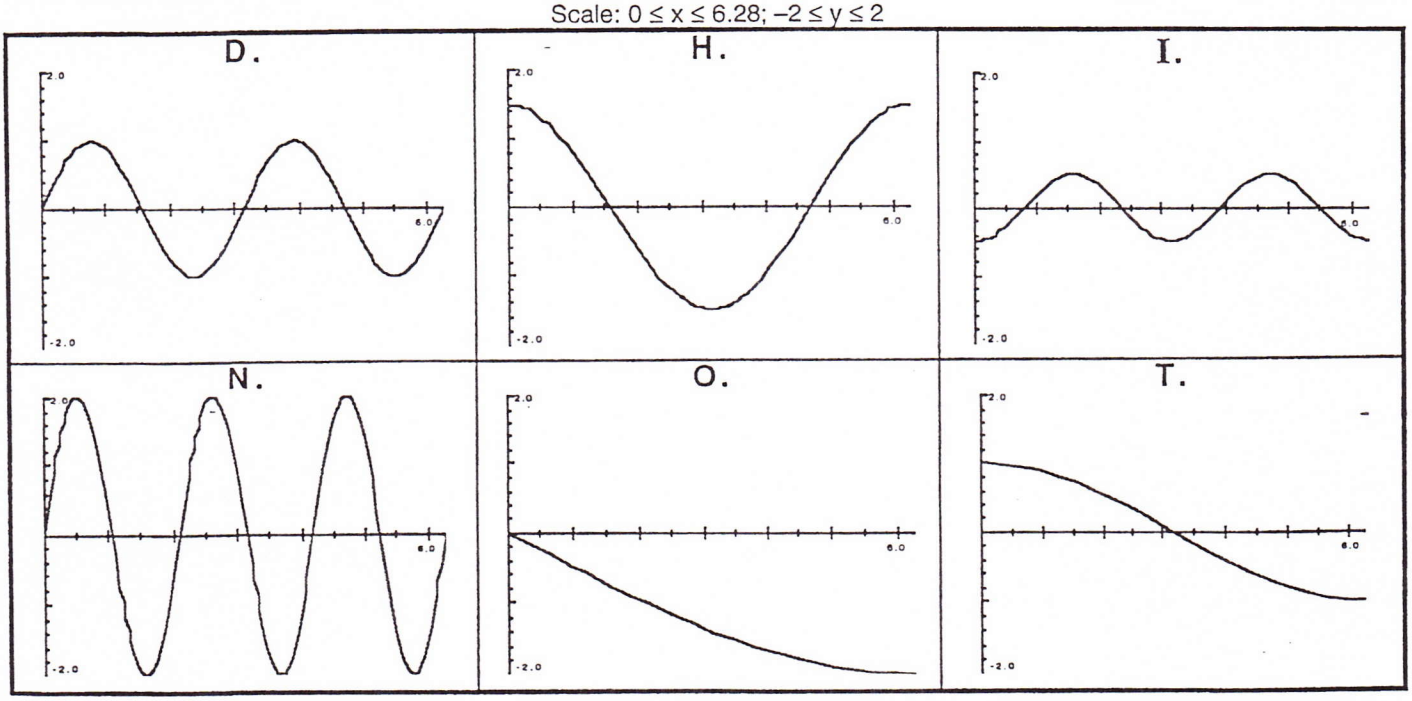
Given the trig functions below, match each with an **A**mplitude, a **P**eriod and a Graph.

$y = \sin(2x)$ 1) **A** = E 2) **P** $\frac{2\pi}{2}$ = π I 3) Graph D	$y = \frac{3}{2}\cos(x)$ D 4) **A** = $\frac{3}{2}$ G 5) **P** 2π 6) Graph H	$y = \cos(\frac{1}{2}x)$ S 7) **A** = E 8) **P** $\frac{2\pi}{1/2} = 4\pi$ 9) Graph T
$y = 2\sin(3x)$ 10) **A** N 11) **P** $\frac{2\pi}{3}$ L 12) Graph N	$y = -\frac{1}{2}\cos(2x)$ 13) **A** D 14) **P** π I 15) Graph I	$y = -2\sin(\frac{1}{4}x)$ T 16) **A** = 2 N 17) **P** $\frac{2\pi}{1/4} = 8\pi$ 18) Graph O

Amplitudes and **P**eriods

D. $\frac{1}{2}$	E. 1	G. $\frac{3}{2}$	N. 2	H. $\frac{\pi}{2}$	I. π	L. $\frac{2\pi}{3}$	O. 2π	S. 4π	T. 8π

Scale: $0 \le x \le 6.28$; $-2 \le y \le 2$



S	I	N	E	(| S | I | G | N |)	O	N	T	H	E	D	O	T	T	E	D	L	I	N	E
8	14	10	7		8	2	4	16		5	12	17	6	1	13	18	17	9	1	3	11	15	16	7

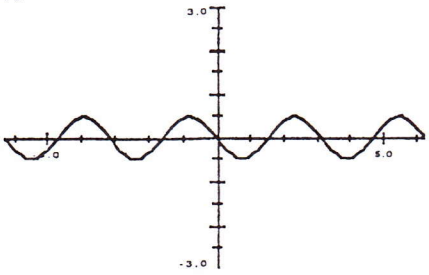
HOW DO TRIG FUNCTIONS GREET EACH OTHER?

Match the equation of each trig function with one of the graphs below.

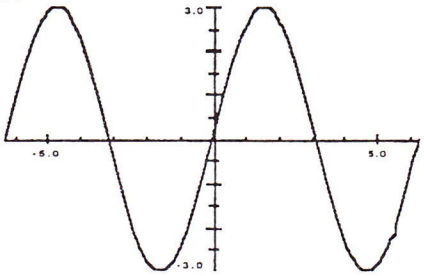
1) $y = 3\sin(x)$ E	2) $y = 2\sin(4x)$ T	3) $y = -\cos(2x)$ H	4) $y = -\frac{1}{2}\sin(2x)$ A
5) $y = \cos(\frac{3}{2}x)$ N	6) $y = 2\cos(x) - 1$ V	7) $y = 2\cos(x) + 1$ I	8) $y = -\sin(x) + 2$ E
9) $y = 1 - \sin(3x)$ I	10) $y = 3\cos(\frac{1}{3}x)$ W	11) $y = \sin(\frac{2}{3}x)$ S	12) $y = \frac{1}{2}\sin(x) - \frac{1}{2}$ W

Scale: $-6.28 \le x \le 6.28$; $-3 \le y \le 3$

A.



E.



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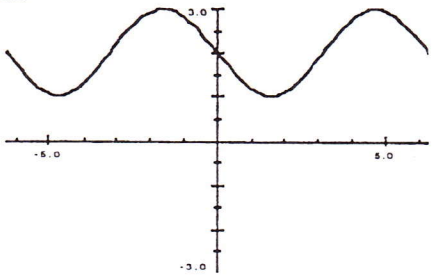
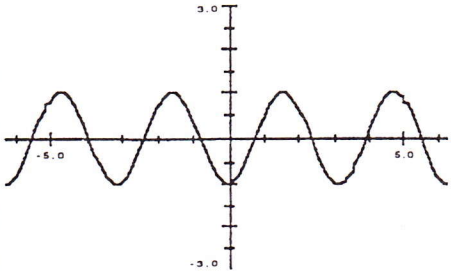
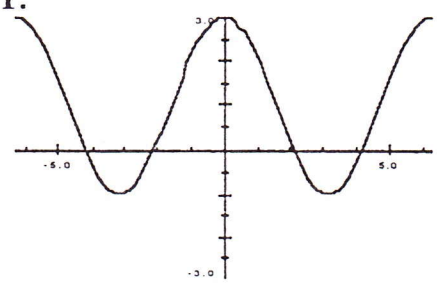


H.



I.



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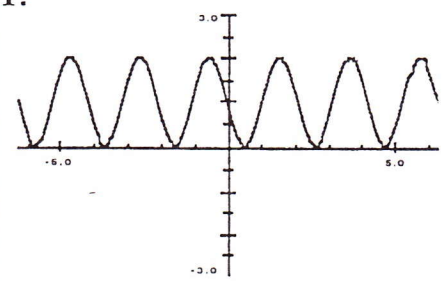

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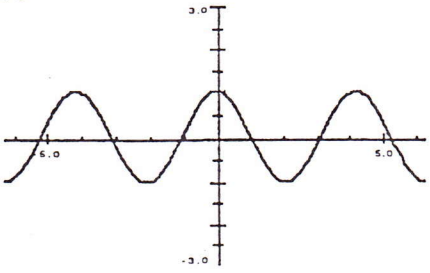

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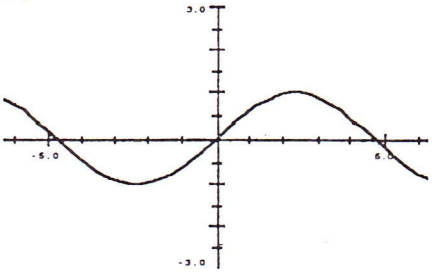
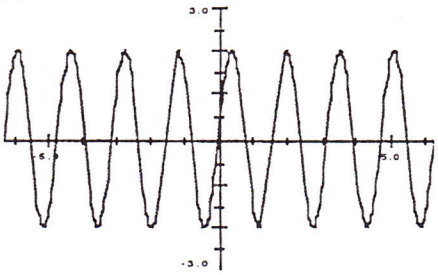


T.



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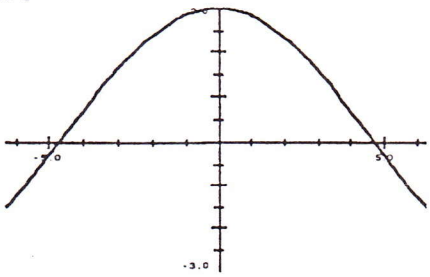
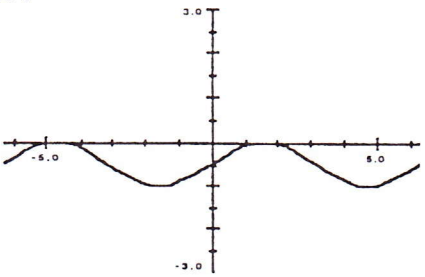
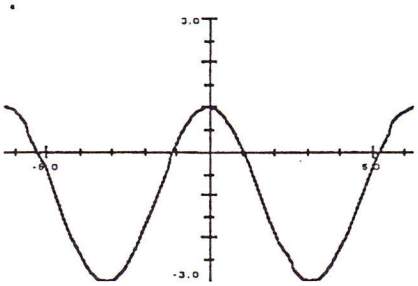


W.



V.



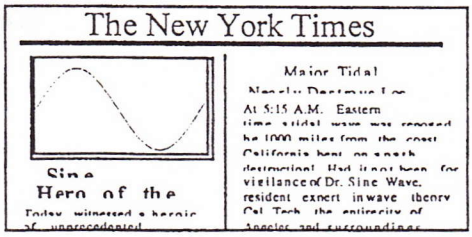
W	I	T	H
12	7	2	3

A
4

S	I	N	I
11	9	5	1

W	A	V	E
10	4	6	8

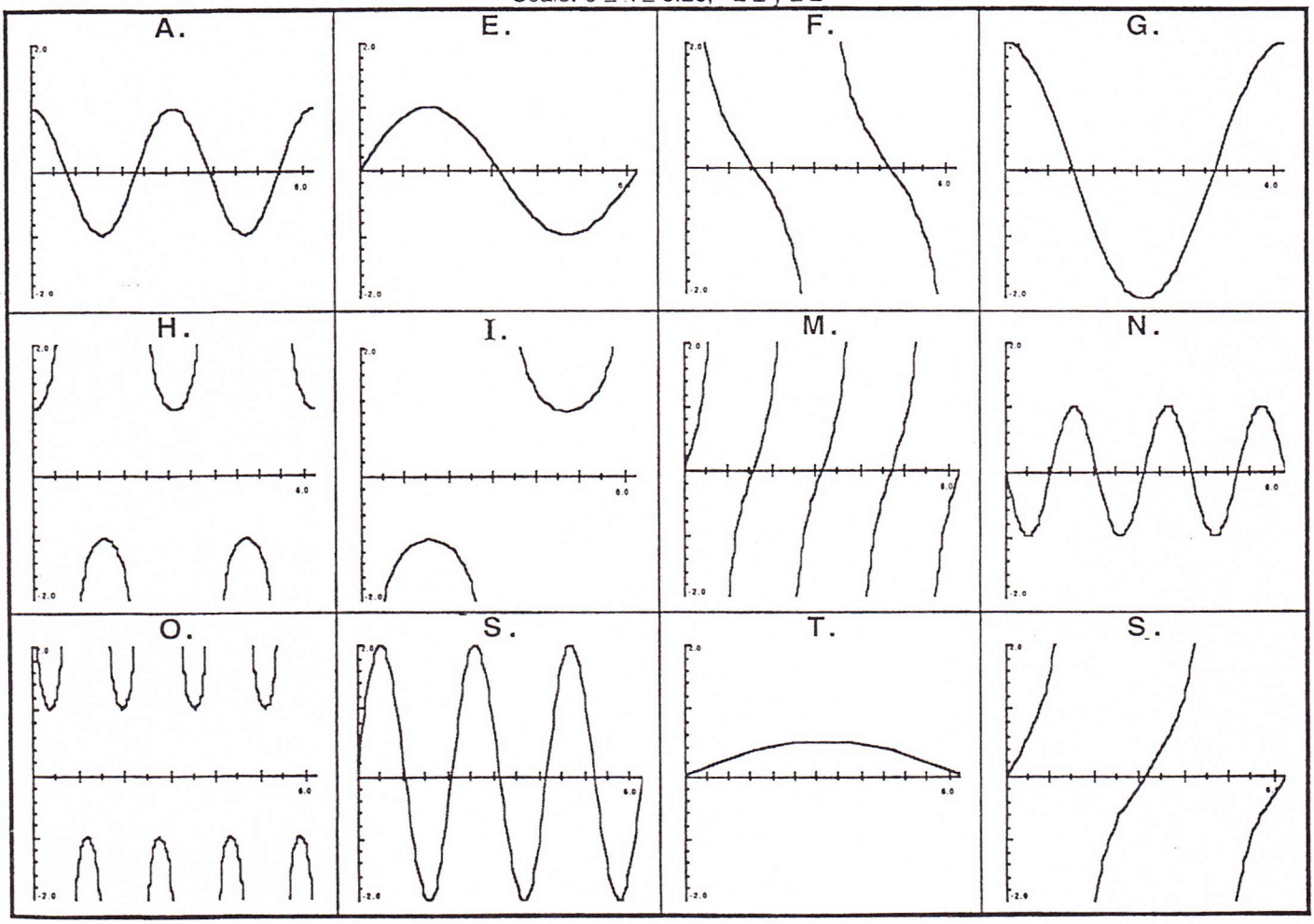
WHAT DOES THIS PICTURE SAY?



Match the equation of each trig function with one of the graphs below.

1) $f(x) = \tan(x)$ S	2) $f(x) = \sin(x)$ E	3) $f(x) = 2\cos(x)$ G	4) $f(x) = 2\sin(3x)$ S
5) $f(x) = \cos(2x)$ A	6) $f(x) = \sec(2x)$ H	7) $f(x) = -\sin(3x)$ N	8) $f(x) = \cot(x)$ F
9) $f(x) = \tan(2x)$ M	10) $f(x) = \frac{1}{2}\sin(\frac{1}{2}x)$ T	11) $f(x) = -\csc(x)$ I	12) $f(x) = \csc(4x)$ O

Scale: $0 \le x \le 6.28$; $-2 \le y \le 2$



A		s	i	n	e		(	S	I	G	N	)
5		4	11	7	2			4	11	3	7	

O	F		t	h	e		T	i	m	e	S
12	8		10	6	2		10	11	9	2	1