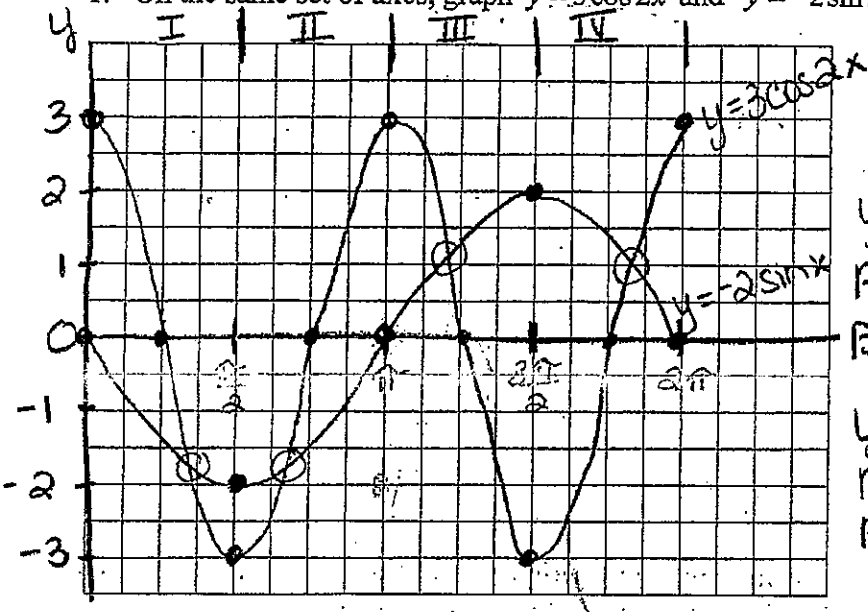
Name: Key Date:

Unit 7 Review – Trigonometric Graphs

1. On the same set of axes, graph $y = 3\cos 2x$ and $y = -2\sin x$ from $0 \le x \le 2\pi$



Xmin Xmax

$y = 3\cos 2x$
$A = 3$
$B = 2$

$y = -2\sin x$
$A = 2$
$B = 1$

Window

Xmin	0
Xmax	2π
Xscl	$\pi/2$
Ymin	-3
Ymax	3
Yscl	1

a. For how many value from $0 \le x \le 2\pi$ does $3\cos 2x = -2\sin x$? P.O.I.? **4 values**

b. In which quadrants are both functions decreasing? **I**

2. Identify the amplitude, frequency, period, phase shift and vertical shift of the following trig functions.

a. $y = -6\sin\left(\frac{x}{6}\right)$

Amplitude 6

Frequency $\frac{1}{6}$

$P = \frac{2\pi}{B}$ Period $2\pi \div \frac{1}{6} = 2\pi \cdot \frac{6}{1} = 12\pi$

Phase shift none

Vertical Shift none

Domain $(-\infty, \infty)$

Range $[-6, 6]$

b. $y = 2\sin\frac{(6x+\pi)}{6} - 5$ *rewrite $y = 2\sin 6\left(x + \frac{\pi}{6}\right) - 5$

Amplitude 2

Frequency 6

Period $\frac{2\pi}{6} = \frac{\pi}{3}$

Phase shift $-\pi/6$

Vertical Shift -5

Domain $(-\infty, \infty)$

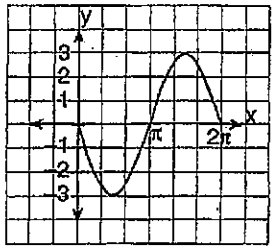
Range $[-7, -3]$

$2 | -5 = -3$

$-2 | -5 = -7$

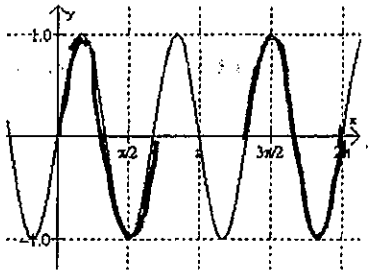
3. Write the equation of the following graphs.

A)



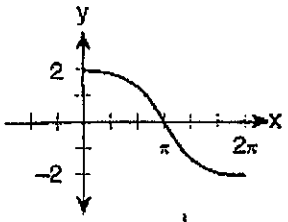
$y = -3\sin x$

B)



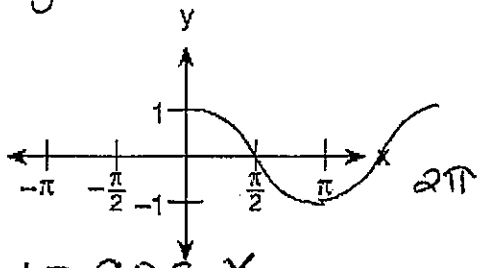
$y = \sin 3x$

C)



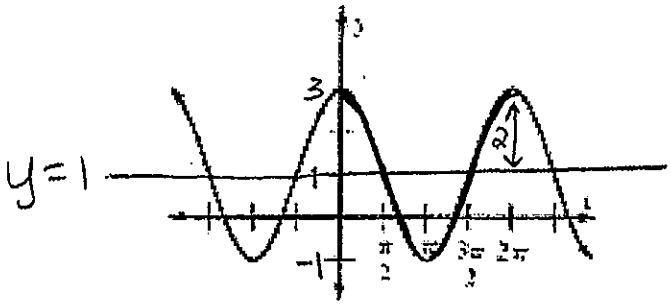
$y = 2\cos\frac{1}{2}x$

D)



$y = \cos x$

4. Examine the graph below and determine the amplitude, period, phase shift and vertical shift of each using **COSINE** as the parent function. Then write an equation of the function in the form $y = a\cos b(x-h)+k$



$y = 1$

$\frac{3--1}{2}$ Amplitude 2

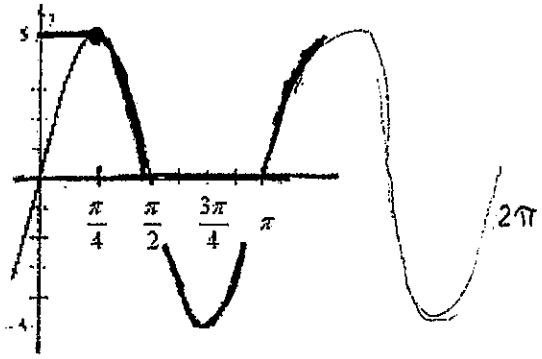
Period $\frac{2\pi}{1} = 2\pi$

Phase shift none

$\frac{3+-1}{2}$ ← Vertical Shift $+1$

COSINE Equation

$y = 2\cos x + 1$



Amplitude 5

Period π $\quad P = \frac{2\pi}{2}$ (waves)

Phase shift $\pi/4$

Vertical Shift none

COSINE Equation

$y = 5\cos 2\left(x - \frac{\pi}{4}\right)$

5. Write the equation of a sine graph if its amplitude is ½ and its period is 4.

$P = \frac{2\pi}{B}$ $\quad \frac{4}{1} = \frac{2\pi}{B}$ $\quad \frac{4B}{4} = \frac{2\pi}{4}$

$B = \frac{\pi}{2}$

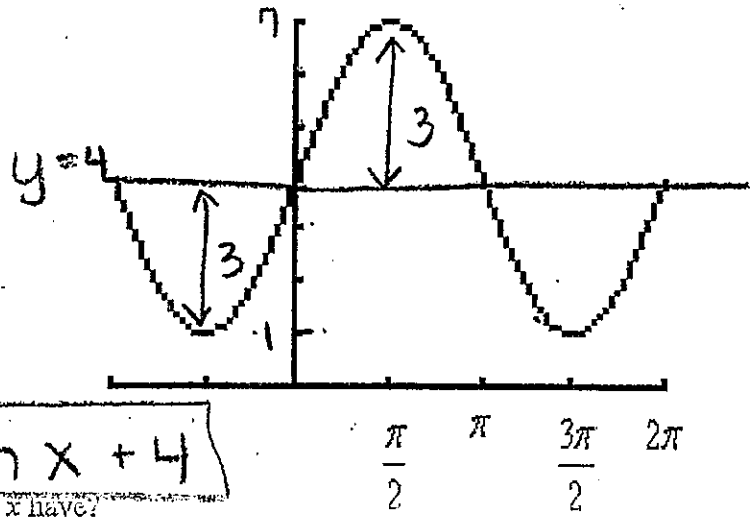
$y = \frac{1}{2}\sin\frac{\pi}{2}x$

6. The following graph can be modeled by the equation $y = A\sin(Bx) + D$ Write the equation of the graph.

Midline: $\frac{1+7}{2} = 4 \rightarrow D$

Amp: $\frac{7-1}{2} = 3 \rightarrow A$

Freq: 1 Full Wave $\rightarrow B$ from 0 to 2π



$y = 3\sin x + 4$

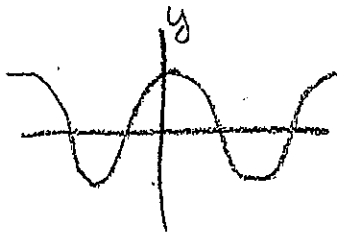
7. Which type of symmetry does the equation $y = \cos x$ have?

(1) line symmetry with respect to the x-axis

(2) line symmetry with respect to $y = x$

(3) point symmetry with respect to the origin

(4) line symmetry with respect to the y-axis



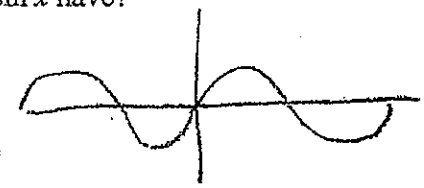
8. Which type of symmetry does the equation $y = \sin x$ have?

(1) line symmetry with respect to the x-axis

(2) line symmetry with respect to $y = x$

(3) point symmetry with respect to the origin

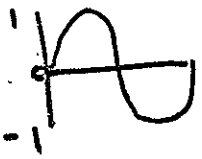
(4) line symmetry with respect to the y-axis



9. Which is not an element in the range of the function y = sin x ?

(1) 1 (2) 2 (3) ½ (4) - ½

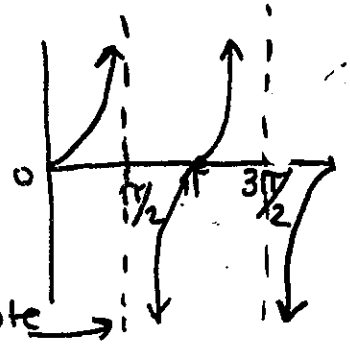
Amplitude = 1



10. Which value is *not* in the domain of the function defined by y = tan x?

(1) π (2) $\frac{\pi}{2}$ (3) $\frac{\pi}{3}$ (4) $\frac{2\pi}{3}$

check on calc!



11. If $\cos\theta = -\frac{6}{10}$ and $\sin\vartheta > 0$, find $\sin\vartheta$ using the identity $\cos^2\vartheta + \sin^2\vartheta = 1$.

$\left(-\frac{6}{10}\right)^2 + \sin^2\theta = 1$

$\frac{36}{100} + \sin^2\theta = 1$

$-\frac{36}{100} \quad -\frac{36}{100}$

$\sin^2\theta = \frac{64}{100}$

$\sqrt{\sin^2\theta} = \sqrt{\frac{64}{100}}$

$\sin\theta = \pm\frac{8}{10}$

S | A

T | C

$\sin\theta = \frac{8}{10}$

12. The average high temperature of a city is recorded for 14 months. The table below shows this data.

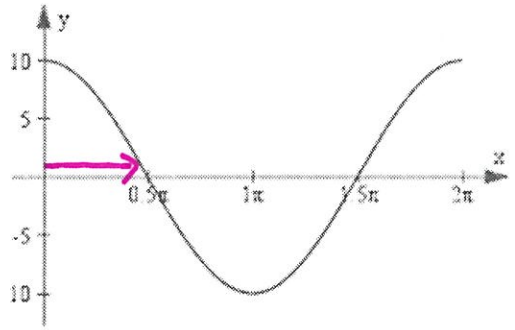
STAT CALC L_1 C:SinReg

Month	1	2	3	4	5	6	7	8	9	10
Temp.	40	48	61	71	81	85	83	77	67	54

Find the ***sinusoidal*** regression equation for the data rounding all values to the nearest thousandth.

$y = 24.886\sin(.482x - 1.449) + 60.213$

13. Write a function in the form $y = a\cos b(x-h)+k$ **AND** $y = a\sin b(x-h)+k$ for the graph shown:



$y = 10\cos x$

$y = -10\sin(x - .5\pi)$

OR

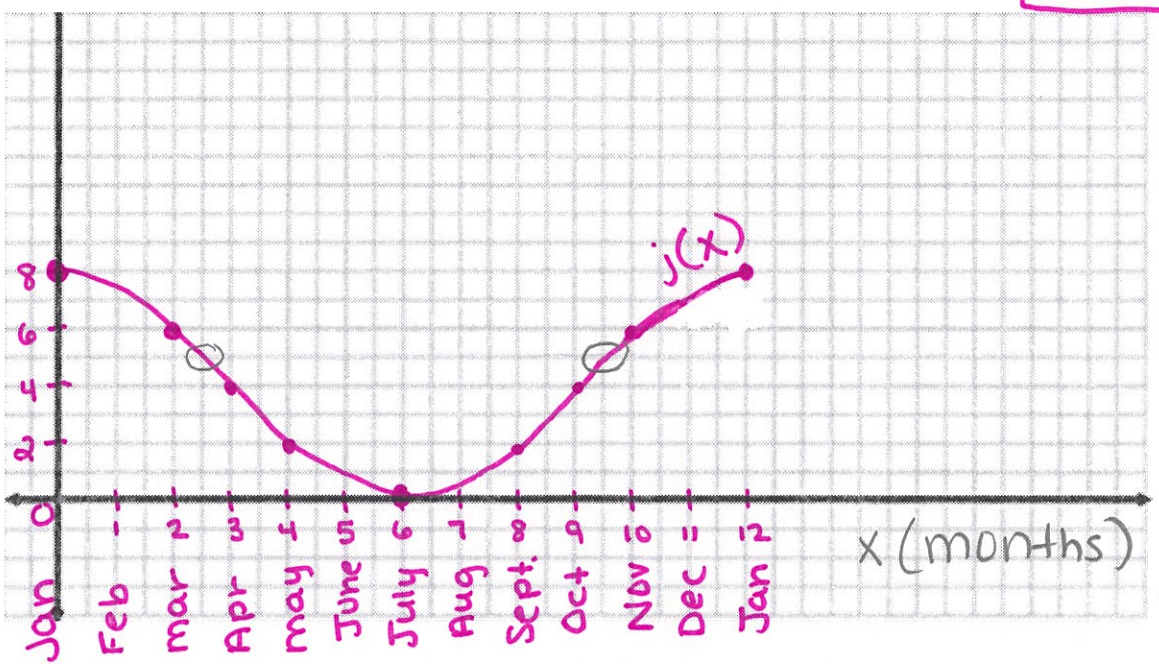
$y = 10\sin(x + .5\pi)$

14. Sales of snow removal equipment approximate a trigonometric function. Sales of snow blowers, in the hundreds of units at Jake's Hardware can be modeled by the function $j(x) = 4\cos\left(\frac{\pi}{6}x\right) + 4$ where x represents time in months with $x = 0$ corresponding to January 1st. Graph this situation for 12 months.

a. When are Jakes sales the lowest? The highest? July Jan

b. How many units of snow removal equipment are sold on November 1st? 600 units

c. In what months are there 500 units of snow removal equipment sold? march + Oct.



Xmin	0
Xmax	12
Xscl	1
Ymin	0
Ymax	8
Yscl	1

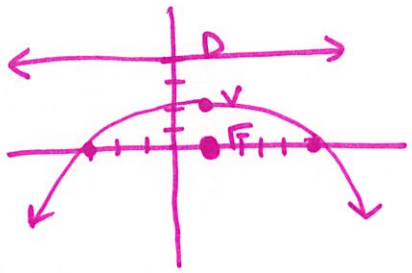
4 | +4 = 8

-4 | +4 = 0

15. Write the equation of a parabola in vertex form whose directrix is y = 4 and focus is (1, 0).

$y-k=\frac{1}{2p}(x-h)^2$ Vertex: $(1,2)$ (h, k)

$y-2=\frac{1}{2(4)}(x-1)^2 \rightarrow \boxed{y=-\frac{1}{8}(x-1)^2+2}$



"DOC" 16. Factor: x^6-27

$\sqrt[3]{x^6}=x^2 \quad \sqrt[3]{27}=3$

S O AP

$\boxed{(x^2-3)(x^4+3x^2+9)}$

$(x^2)^2 \quad (3)^2$

"SOC" 17. Factor: $8x^{12}+1$

$\sqrt[3]{8x^{12}}=2x^4 \quad \sqrt[3]{1}=1$

S O AP

$\boxed{(2x^4+1)(4x^8-2x^4+1)}$

$(2x^4)^2 \quad (1)^2$

18. Factor: $3x^5-6x^4-240x^3$

GCF $3x^3(x^2-2x-80)$

Easy Tri $\boxed{3x^3(x-10)(x+8)}$

19. Factor: $12x^3-9x^2+8x-6$

Factor by grouping $3x^2(4x-3)+2(4x-3)$

$\boxed{(4x-3)(3x^2+2)}$

20. Simplify the following expression:

LCD $=x^2y^2$

$$\left(\frac{\frac{1}{x}+\frac{1}{y}}{\frac{1}{x^2}-\frac{1}{y^2}}\right) \quad \frac{xy^2+x^2y}{y^2-x^2}=\frac{xy(y+x)}{(y-x)(y+x)} \quad \text{GCF, DOTS} \quad =\boxed{\frac{xy}{y-x}}$$

21. If $x^2(x+3)-9(x+3)$ is equivalent to $(x+3)^n(x-3)$, what is the value of n?

GCF $(x+3)(x^2-9)$

$(x+3)(x+3)(x-3)$

$(x+3)^2(x-3)$

$\boxed{n=2}$

22. Which of the following functions decreases as both ends of the graph approaches both positive and negative infinity?

1) $f(x)=x^3-4x^2+x$

2) $f(x)=x^4-4x^3+2x^2+8$

3) $g(x)=-2x^3-4x^2+9$

4) $r(x)=-x^4+9x^3+x^2+8x+2$

⊖ coefficient even degree

DON'T FORGET TO CORRECT YOUR ANSWERS IN A DIFFERENT COLOR!!!