Lesson 4-4: Graphing Sine and Cosine Functions WS1

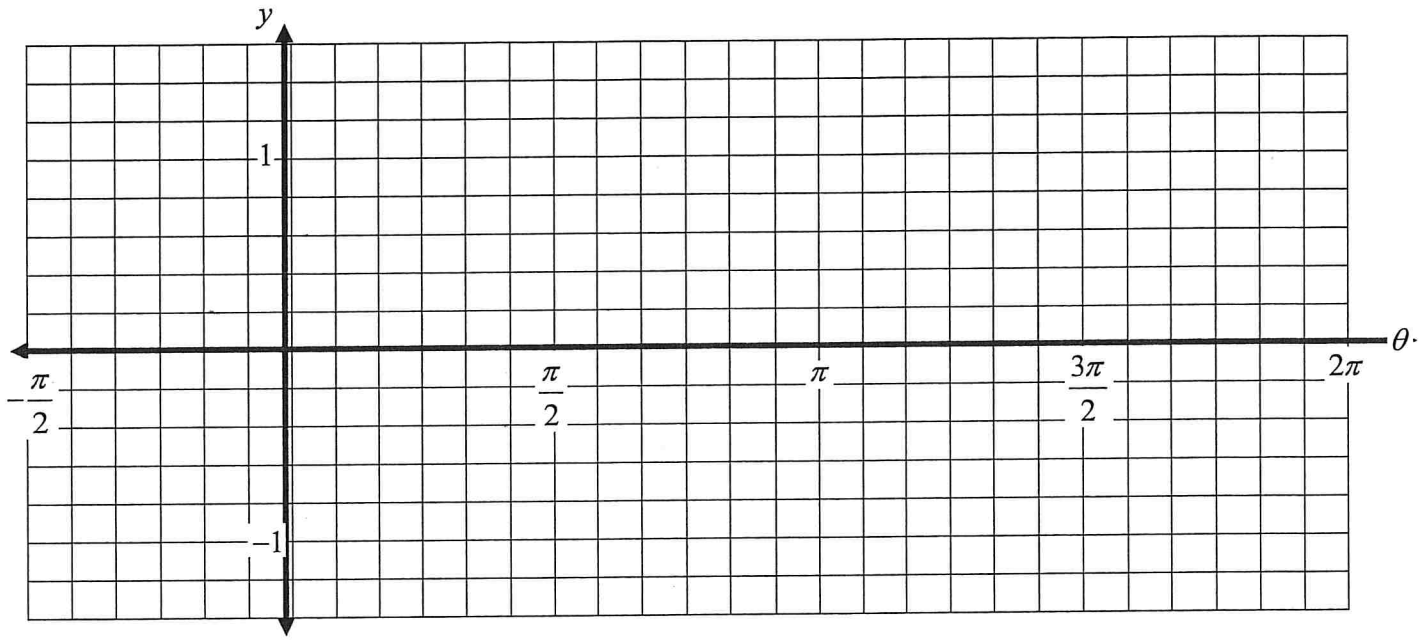
APPROXIMATE VALUES OF TRIGONOMETRIC FUNCTIONS

Use your calculator to find the approximate values of the following angle measures. Find values to **three** decimal places. Make sure your calculator is set to **radians**. Remember, the pattern from quadrant to quadrant on the unit circle. This pattern will follow here as well.

Radians	$\sin\theta$	$\cos\theta$	$\tan\theta$
0			
$\frac{\pi}{6}$			
$\frac{\pi}{4}$			
$\frac{\pi}{3}$			
$\frac{\pi}{2}$			
$\frac{2\pi}{3}$			
$\frac{3\pi}{4}$			
$\frac{5\pi}{6}$			
π			
$\frac{7\pi}{6}$			
$\frac{5\pi}{4}$			
$\frac{4\pi}{3}$			
$\frac{3\pi}{2}$			
$\frac{5\pi}{3}$			
$\frac{7\pi}{4}$			
$\frac{11\pi}{6}$			
2π			

THE SINE FUNCTION

Use the Approximate Value Worksheet and plot the ordered pairs for $0 \le \theta \le 2\pi$ for $\sin\theta$ on the graph below.



(each square grid along the horizontal axis represents 15° or $\frac{\pi}{12}$ radians)

Now, using the graph, fill the blanks.

DOMAIN _____

RANGE _____

X-INTERCEPTS _____

Y-INTERCEPTS _____

PERIOD _____

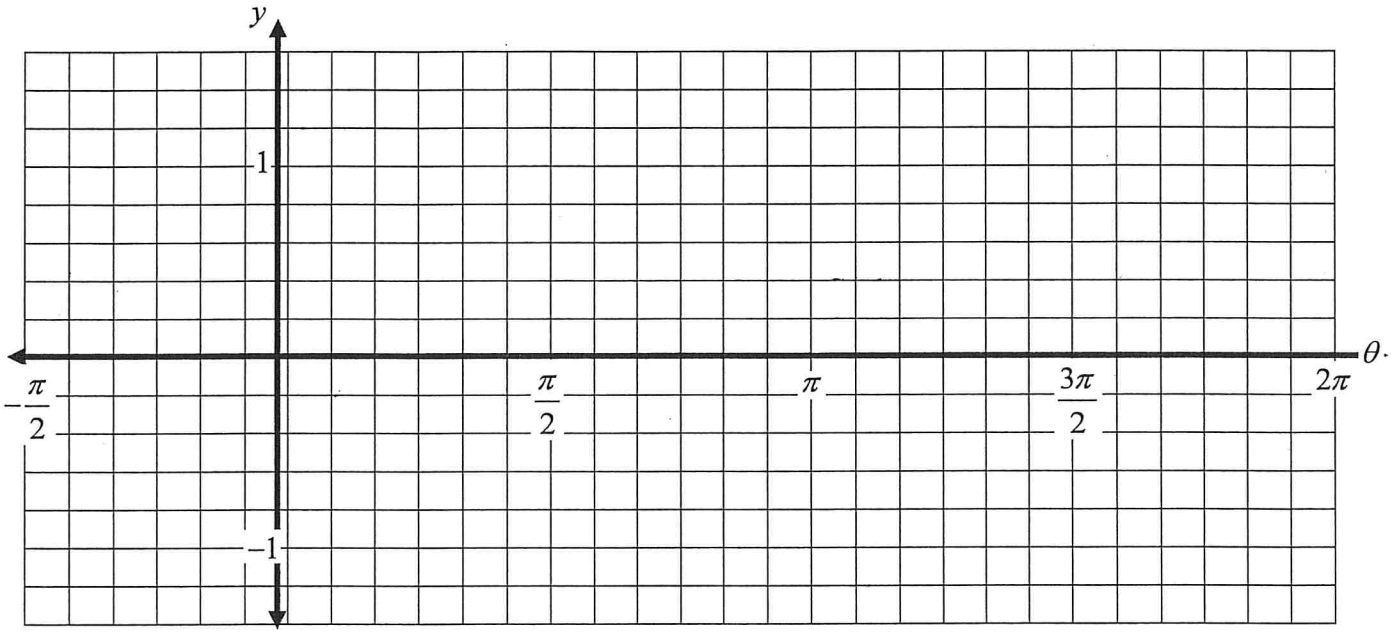
AMPLITUDE _____

ASYMPTOTES _____

EVEN OR ODD FUNCTION? _____

THE COSINE FUNCTION

Use the Approximate Value Worksheet and plot the ordered pairs for $0 \le \theta \le 2\pi$ for $\cos\theta$ on the graph below.



(each square grid along the horizontal axis represents 15° or $\frac{\pi}{12}$ radians)

Now, using the graph, fill the blanks.

DOMAIN _____

RANGE _____

X-INTERCEPTS _____

Y-INTERCEPTS _____

PERIOD _____

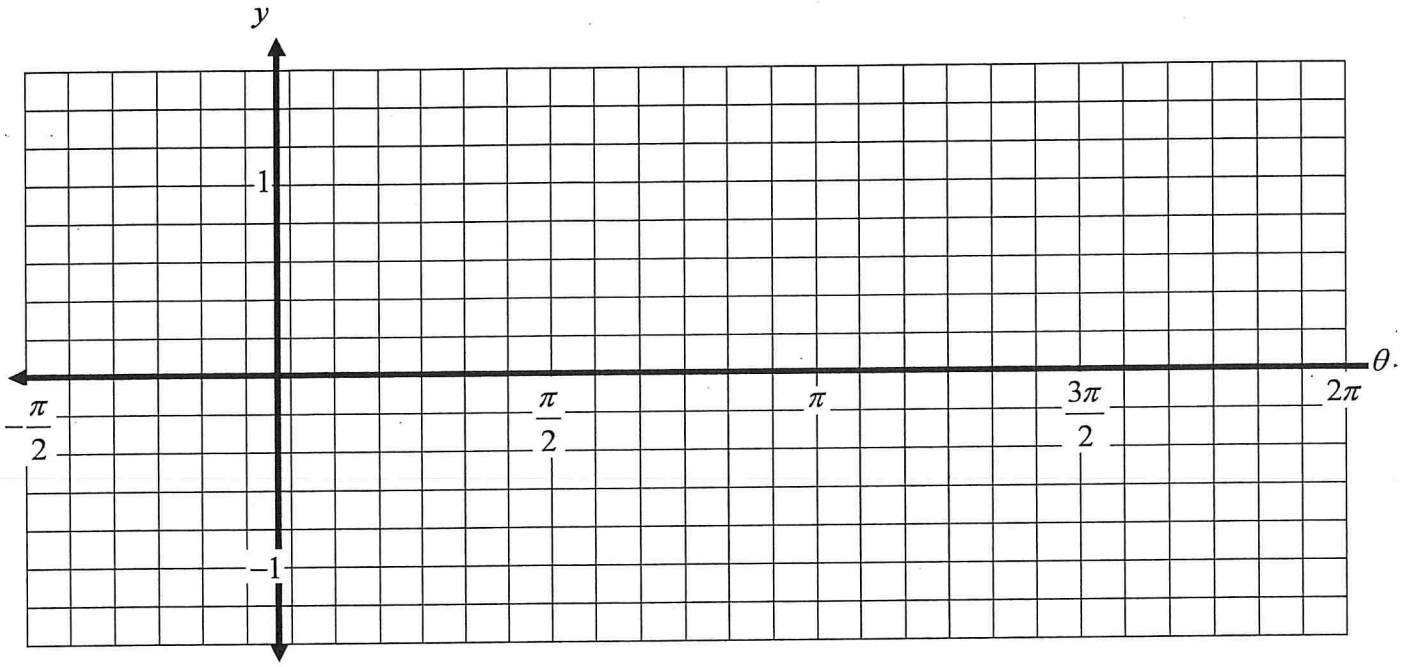
AMPLITUDE _____

ASYMPTOTES _____

EVEN OR ODD FUNCTION? _____

THE TANGENT FUNCTION

Use the Approximate Value Worksheet and plot the ordered pairs for $0 \le \theta \le 2\pi$ for $\tan\theta$ on the graph below.



(each square grid along the horizontal axis represents 15° or $\frac{\pi}{12}$ radians)

Now, using the graph, fill the blanks.

DOMAIN _____

RANGE _____

X-INTERCEPTS _____

Y-INTERCEPTS _____

PERIOD _____

AMPLITUDE _____

ASYMPTOTES _____

EVEN OR ODD FUNCTION? _____

5

4-4 Homework WS2

Parent Sine or Cosine Function: $y = \sin x$ $y = \cos x$

General form of Sine or Cosine Function: $y = a\sin bx$ $y = a\cos bx$

Amplitude = _____ Period = _____

Example 1: Using your TI83, Graph and Compare the following functions.

$y = \sin x$ $y = 3\sin x$

- Describe how the two graph are different.
- What is the value of the maximum of each?
- What is the value of the minimum of each?

Amplitude = _____

What is the amplitude of the following equations?

a) $y = 4\sin x$ b) $y = \frac{1}{2}\sin x$ c) $y = -2\sin x$

Example 2: Using your TI83, Graph and Compare the following functions.

$y = \sin x$ $y = \sin 2x$

- Describe how the two graph are different.
- What is the value of the maximum?
- What is the value of the minimum?
- How many cycles of the sine curve are there on each graph from 0 to 2π?

How many cycles of the sine curve are on the graphs for the equations below?

a) $y = \sin 3x$ b) $y = \sin\frac{1}{2}x$ c) $y = \sin 4x$

Example 3: Identify the amplitude and period for the following sine functions.

a) $y = 5\sin x$ b) $y = \sin 4x$ c) $y = 3\sin 2x$

amplitude: _____ amplitude: _____ amplitude: _____

period: _____ period: _____ period: _____

6a

Lesson 4-4: Graphing Sine and Cosine Functions HW WS1

$$y = A\sin B(x - C) + D$$

$|A|$ = amplitude $\quad B = \dfrac{2\pi}{period} \quad Period = \dfrac{2\pi}{|B|} \quad C$ = Phase Shift $\quad D$ = Vertical Shift

	Function	Amplitude	Period	Even/Odd
1.	$y = 2\cos x$			
2.	$y = 3\sin x$			
3.	$y = -\cos x$			
4.	$y = -\sin x$			
5.	$y = -3\cos x$			
6.	$y = \frac{1}{2}\sin x$			

	Function	Amplitude	Period $\frac{2\pi}{\lvert B\rvert}$
7.	$y = 2\sin\frac{1}{6}x$		
8.	$y = 3\sin\frac{3}{2}x$		
9.	$y = -\sin 4x$		
10.	$y = -\cos 2x$		
11.	$y = 2\cos\frac{1}{2}x$		
12.	$y = \frac{1}{2}\cos\frac{1}{3}x$		
13.	$y = 2\cos 4x$		
14.	$y = 3\cos\frac{2}{3}x$		
15.	$y = \cos\frac{1}{6}x$		

4.6

	Function	Amplitude	Period	Phase Shift
16.	$y=-2\sin\left(x-\frac{\pi}{2}\right)$			
17.	$y=\frac{1}{2}\cos(x+\pi)$			
18.	$y=-\cos 2\left(x-\frac{\pi}{3}\right)$			
19.	$y=5\sin 3\left(x-\frac{\pi}{4}\right)$			
20.	$y=3\cos 4\left(x+\frac{\pi}{4}\right)$			
21.	$y=-2\cos\left(x-\frac{\pi}{4}\right)$			
22.	$y=\cos\left(x+\frac{\pi}{6}\right)$			
23.	$y=-2\sin 2\left(x-\frac{\pi}{4}\right)$			

		Amplitude	Period	Phase Shift	Vertical Shift
24.	$y=3\cos 2\left(x+\frac{\pi}{2}\right)-1$				
25.	$y=-2\sin 3\left(x-\frac{\pi}{6}\right)+1$				
26.	$y=3\sin(4x+\pi)+2$				
27.	$y=2\cos 3\left(x+\frac{\pi}{6}\right)+1$				
28.	$y=-3\cos 2\left(x-\frac{\pi}{4}\right)+2$				
29.	$y=3\sin 3\left(x+\frac{\pi}{4}\right)-2$				

Graphing Sine and Cosine Functions:

To graph the sine and cosine functions, you need five key points which include the x-intercepts and the maximum and minimum points. Take the following steps when graphing the sine and cosine functions.

Step 1: Find the amplitude and period of the function.
Step 2: Divide the section of the graph into four equal parts.
Step 3: Find the intercept points.
Step 4: Find the max and min points.
Step 5: Graph the five points and draw a smooth curve through them.

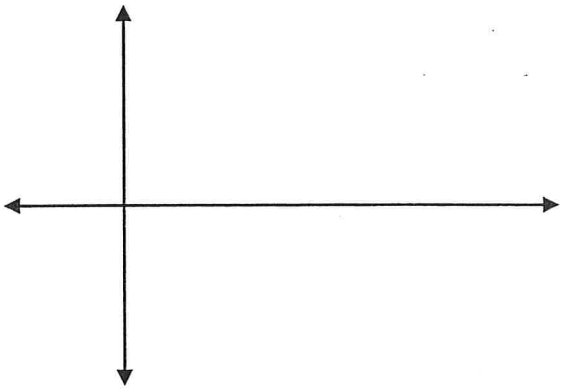
Example 4: Graph $y = \sin 4x$

Amplitude = _____

Period = _____

x-intercepts = _____, _____, _____

max = _____ min = _____



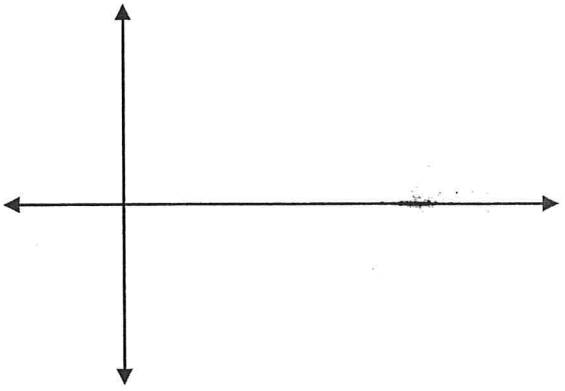
Example 5: Graph $y = 3\sin 2x$

Amplitude = _____

Period = _____

x-intercepts = _____, _____, _____

max = _____ min = _____



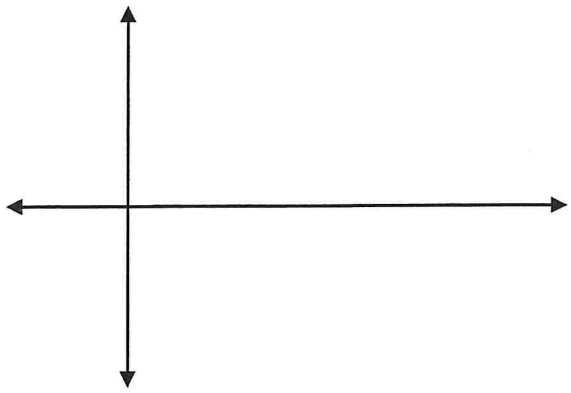
Example 6: Graph $y = \cos 2x$

Amplitude = _____

Period = _____

x-intercepts = _____, _____,

max = _____ min = _____



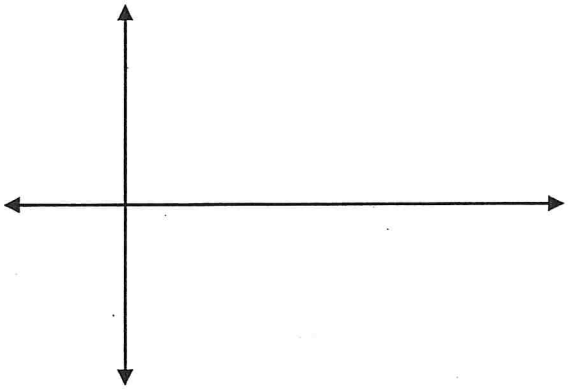
Example 7: Graph $y = .25 \sin 4x$

Amplitude = _____

Period = _____

x-intercepts = _____, _____, _____

max = _____ min = _____



Graphing the Tangent Function

The parent tangent function $y = \tan x$ has a period of π. When graphing the tangent function, you will need to know the x-intercept, vertical asymptotes, the halfway points, and the period.

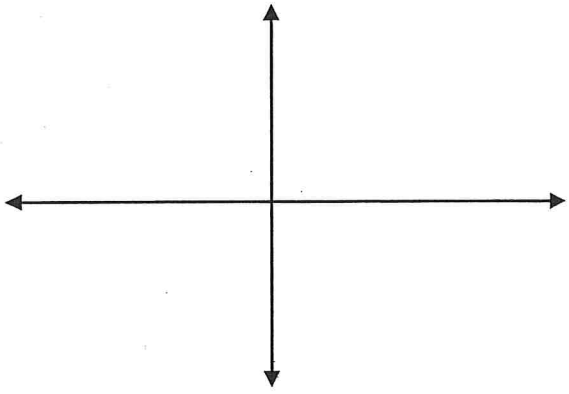
Period = _____ Vertical asymptotes are defined at odd multiples of _____

Example 8: Graph $y = 3 \tan 2x$.

Period = _____ x-intercept = _____

Vertical Asymptotes = _____, _____

Halfway points = _____, _____

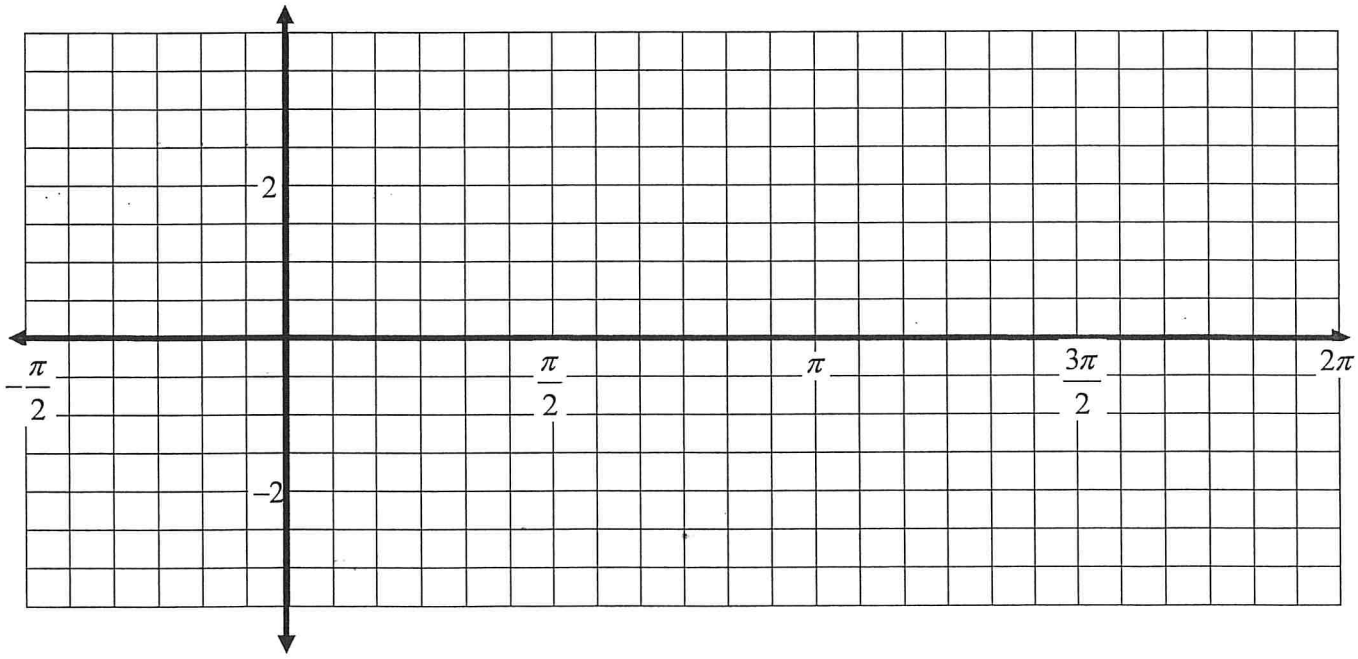


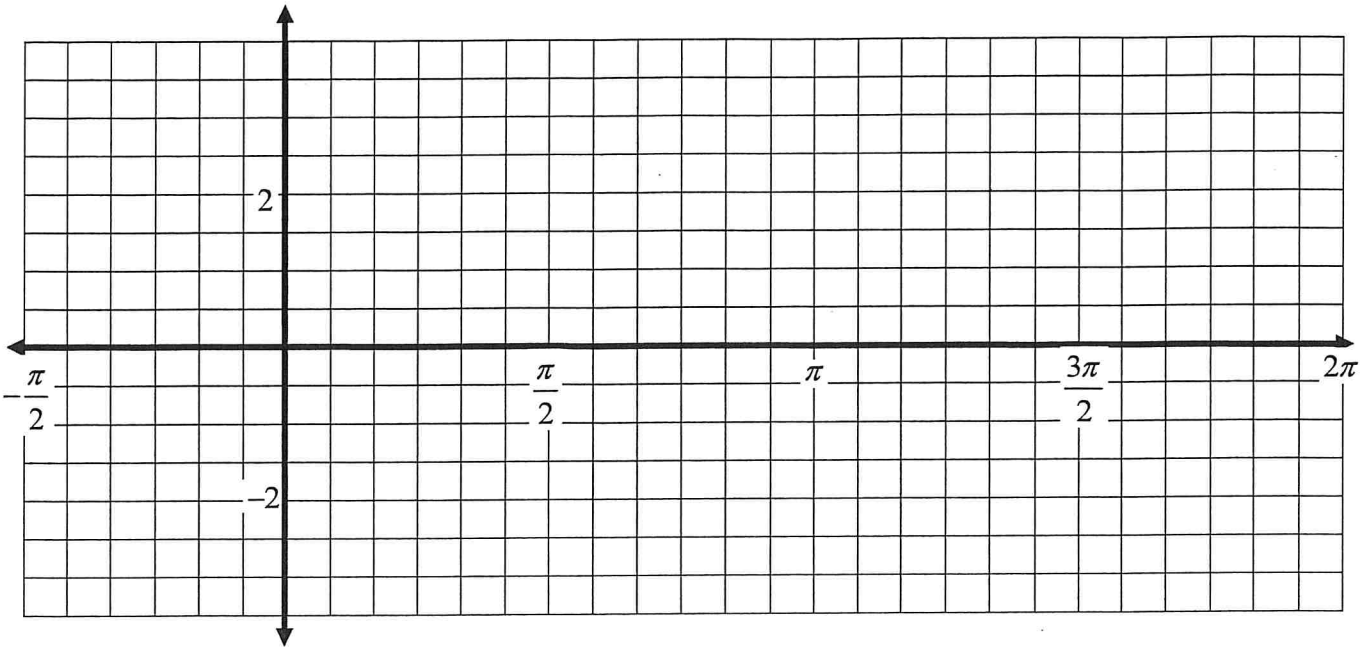
Homework Sheet

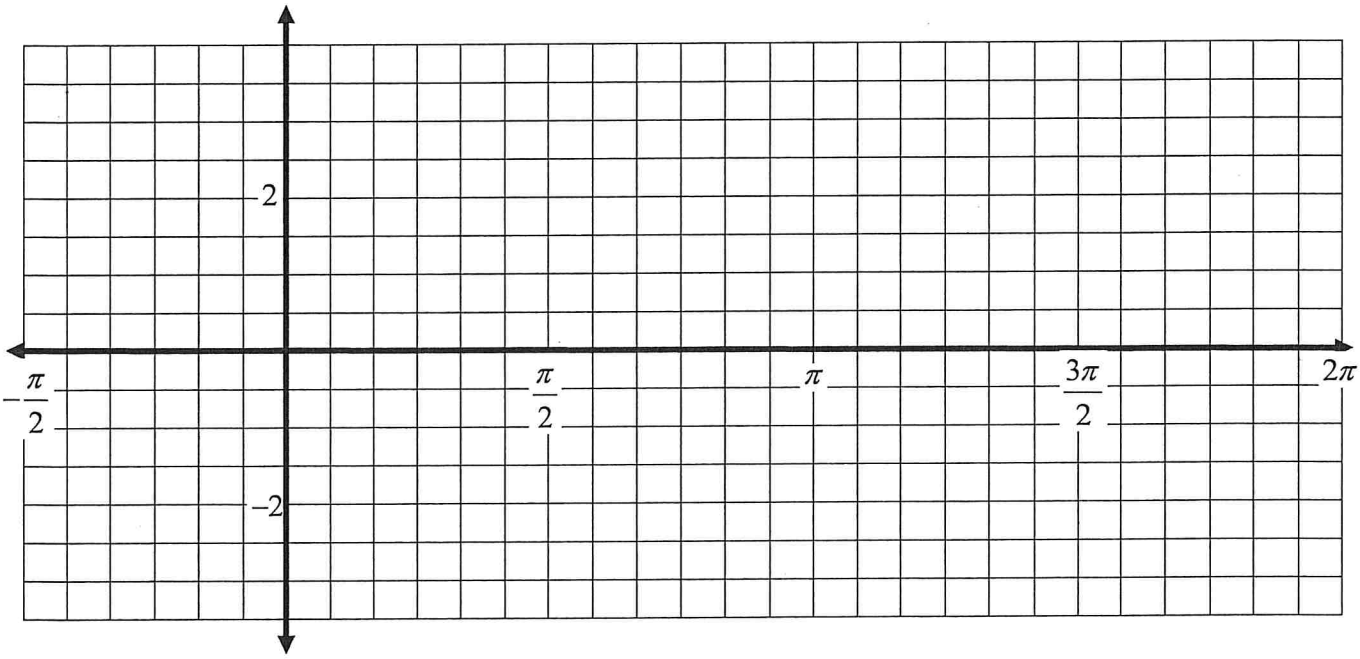
1. Complete the table and graph the ones that are checked on the grids below.

Equation	Amplitude	Period	Graph
$y = \sin 3x$			
$y = 2\cos x$			
$y = 5\cos\frac{1}{2}x$			
$y = \frac{1}{2}\sin 6x$			✓
$y = 4\tan 2x$			✓
$y = 3\sin 2x$			
$y = \frac{1}{2}\cos 2x$			
$y = 3\cos 3x$			✓
$y = 2\tan 3x$			

2. Graph each of the above checked functions on the grids provided.







3. Write an equation using $y = \sin x$ as the parent function.

a) Amplitude = 3, period = 2π. _____

b) Amplitude = $\frac{1}{2}$ period = π. _____

4. Write an equation using $y = \cos x$ as the parent function.

a) Amplitude = 4, period = π. _____

b) Amplitude = $\frac{1}{3}$ period = 4π. _____

5. Given the scale change, write an equation. (remember, the "*b*" value in the equation is the reciprocal of the "*b*" in the scale change *S(bx, ay)*)

a) parent function $y = \cos x$ $S(2x, 3y)$ _____

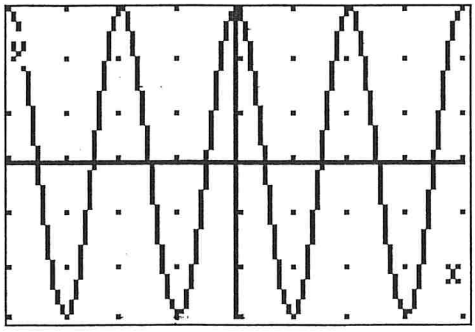
b) parent function $y = \sin x$ $S(\frac{1}{2}x, 5y)$ _____

c) parent function $y = \sin x$ $S(4x, \frac{1}{2}y)$ _____

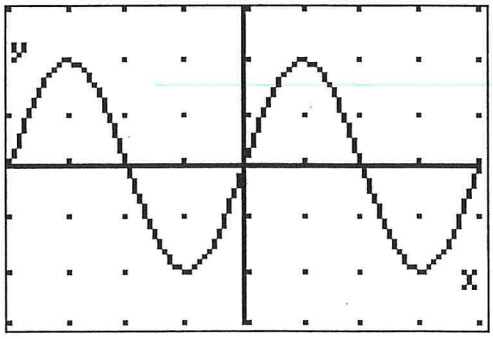
a) parent function $y = \cos x$ $S(\frac{1}{4}x, \frac{1}{2}y)$ _____

6. Identify the equation of the trigonometric function graphed. Given the display window as
$-2\pi \le x \le 2\pi$ *and* $-3 \le y \le 3$

a)



b)

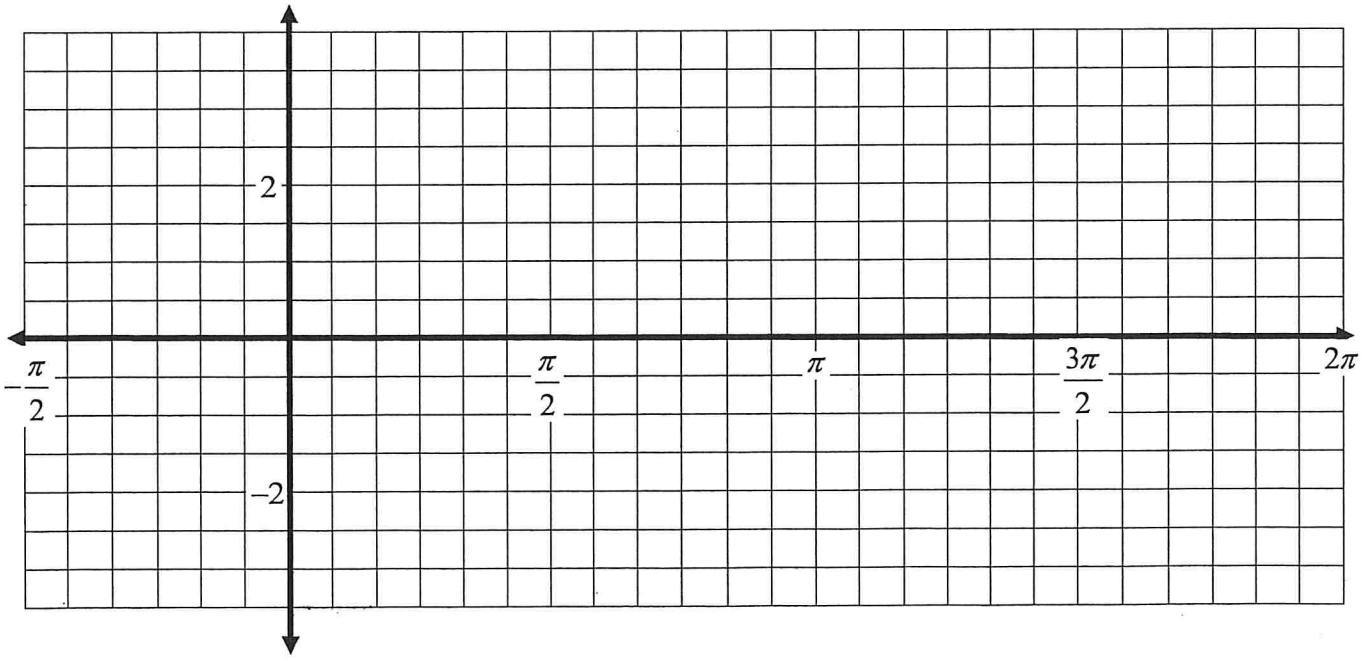


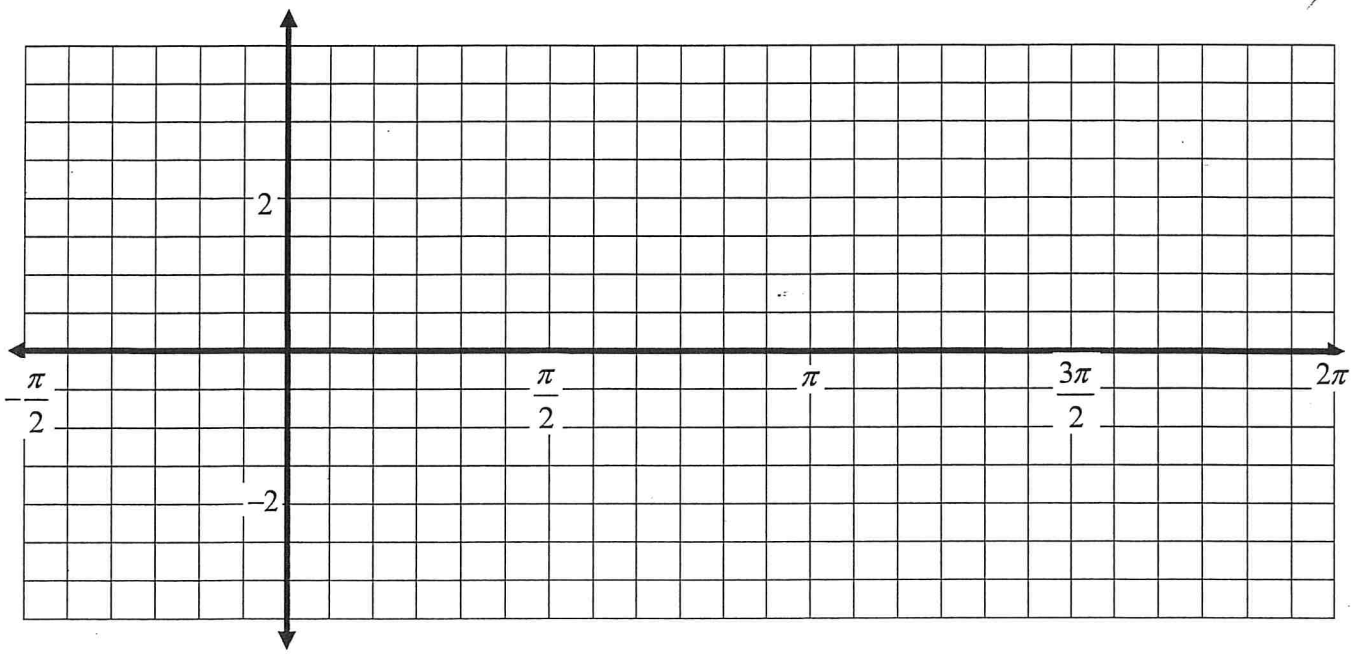
Homework Sheet

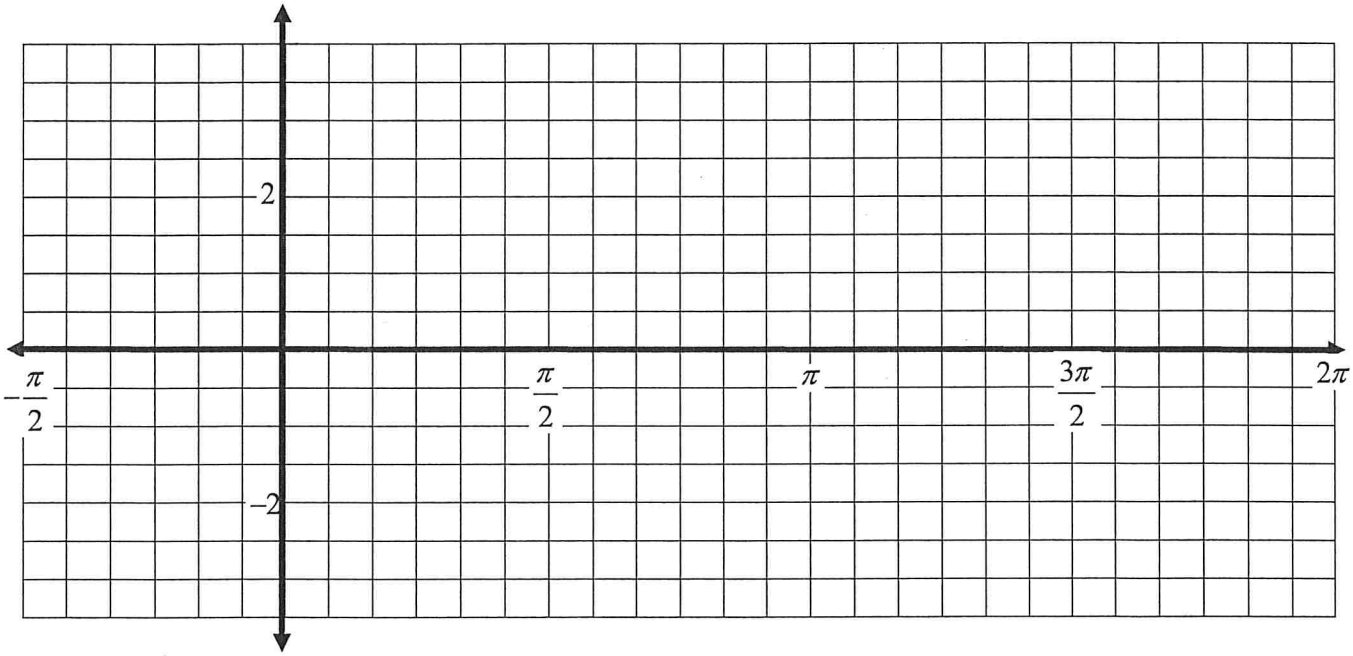
1. Complete the table and **graph** the ones that are **checked** on the grids below.

Equation	Amplitude	Period	Graph each over $-\frac{\pi}{2} \le \theta \le 2\pi$
$y = \sin\frac{1}{2}x$			
$y = 3\cos x$			
$y = 2\cos\frac{1}{4}x$			
$y = \frac{1}{2}\sin 4x$			✓ graph several cyles
$y = 3\tan 2x$			✓ graph several cycles
$y = 2\sin\frac{2}{3}x$			
$y = \frac{1}{4}\cos 2x$			
$y = 2\cos\frac{1}{2}x$			✓ You will only graph a part of the curve.
$y = \frac{1}{2}\tan 2x$			

2. Graph each of the above checked functions on the grids provided. Label graphs with equation.




2
−2
$-\frac{\pi}{2}$
$\frac{\pi}{2}$
π
$\frac{3\pi}{2}$
2π


2
−2
$-\frac{\pi}{2}$
$\frac{\pi}{2}$
π
$\frac{3\pi}{2}$
2π

3. Write an equation using $y = \sin x$ as the parent function.

a) Amplitude = 4, period = 2π. _____

b) Amplitude = $\frac{1}{4}$ period = $\frac{\pi}{4}$. _____

4. Write an equation using $y = \cos x$ as the parent function.

a) Amplitude = 5, period = π. _____

b) Amplitude = $\frac{1}{2}$ period = 6π. _____

5. Given the scale change, write an equation. (remember, the "*b*" value in the equation is the reciprocal of the "*b*" in the scale change *S(bx, ay)*)

a) parent function $y = \cos x$ $S(\frac{1}{2}x, 3y)$ _____

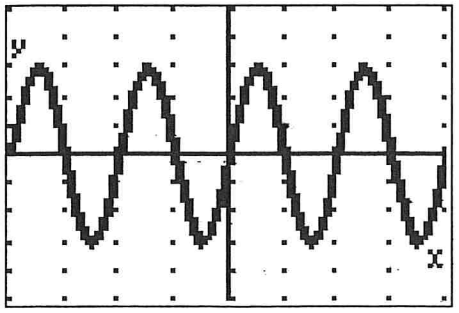
b) parent function $y = \sin x$ $S(2x, 5y)$ _____

c) parent function $y = \sin x$ $S(3x, \frac{1}{2}y)$ _____

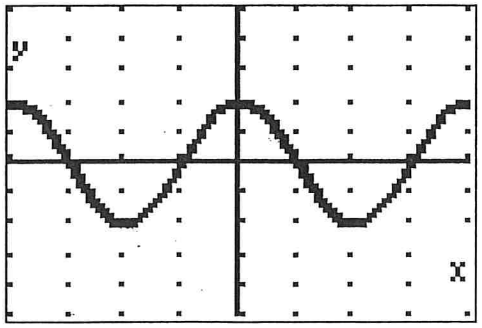
a) parent function $y = \cos x$ $S(\frac{1}{2}x, \frac{1}{4}y)$ _____

6. Identify the equation of the trigonometric function graphed. Given the display window as
$-2\pi \le x \le 2\pi$ *and* $-5 \le y \le 5$

a)



b)



	Function	Amplitude	Period	Phase Shift
16.	$y=-2\sin\left(x-\frac{\pi}{2}\right)$			
17.	$y=\frac{1}{2}\cos(x+\pi)$			
18.	$y=-\cos 2\left(x-\frac{\pi}{3}\right)$			
19.	$y=5\sin 3\left(x-\frac{\pi}{4}\right)$			
20.	$y=3\cos 4\left(x+\frac{\pi}{4}\right)$			
21.	$y=-2\cos\left(x-\frac{\pi}{4}\right)$			
22.	$y=\cos\left(x+\frac{\pi}{6}\right)$			
23.	$y=-2\sin 2\left(x-\frac{\pi}{4}\right)$			

		Amplitude	Period	Phase Shift	Vertical Shift
24.	$y=3\cos 2\left(x+\frac{\pi}{2}\right)-1$				
25.	$y=-2\sin 3\left(x-\frac{\pi}{6}\right)+1$				
26.	$y=3\sin(4x+\pi)+2$				
27.	$y=2\cos 3\left(x+\frac{\pi}{6}\right)+1$				
28.	$y=-3\cos 2\left(x-\frac{\pi}{4}\right)+2$				
29.	$y=3\sin 3\left(x+\frac{\pi}{4}\right)-2$				

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PRECALC I – 4.6-4.8 WORKSHEET I

EQUATION	AMPLITUDE	PERIOD	PHASE SHIFT	VERTICAL SHIFT	$(X,Y)\rightarrow(\ ,\ )$	GRAPH
1. $y=2\sin x$						✓
2. $y=-2\sin x$						✓
3. $y=2\tan\left(\frac{1}{3}x\right)$						
4. $y=2\sin\left(x+\frac{\pi}{2}\right)$						✓
5. $y=\cos(3x)+1$						
6. $y=\tan(x+\pi)+2$						
7. $y=3\cos(x-\pi)-1$						✓

Write an equation using $y=\sin x$ as the parent function.

8. Amplitude = *5*, period = 2π, phase shift = $\frac{\pi}{3}$ units to the right, vertical shift = none.

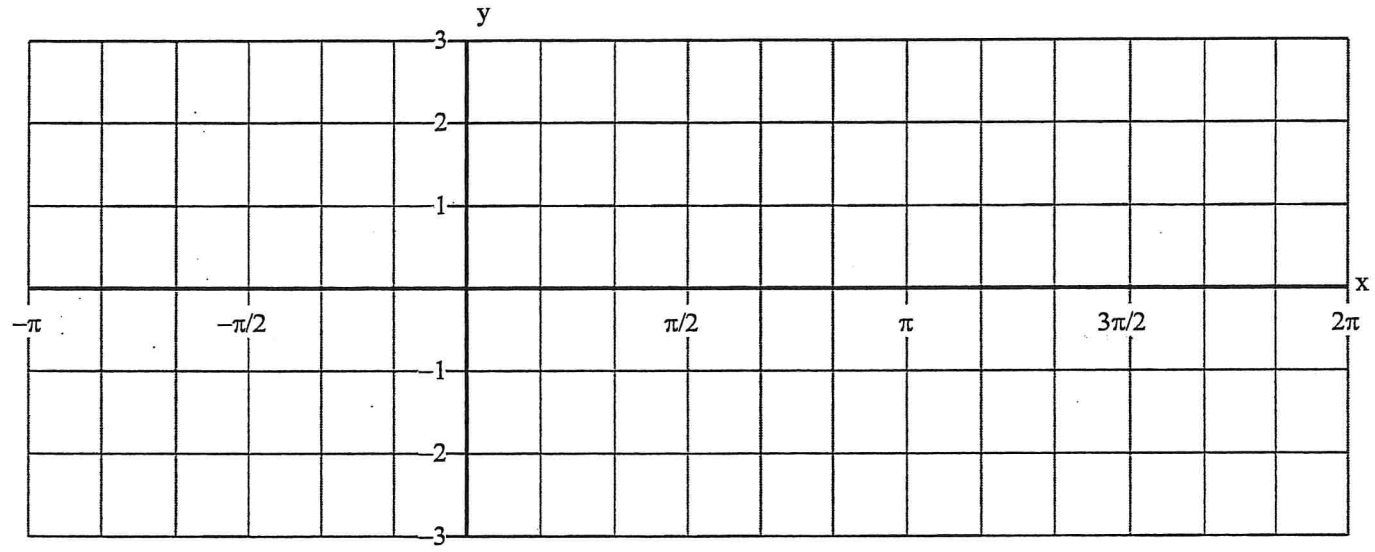
_____

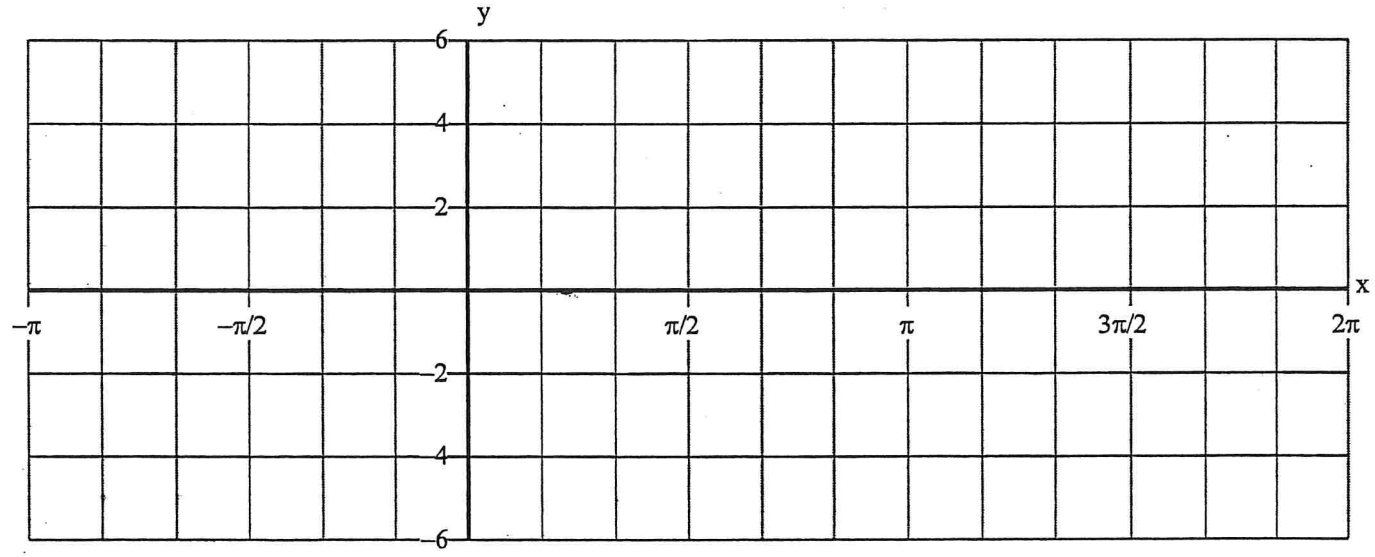
9. Amplitude = $\frac{2}{3}$, period = $\frac{\pi}{4}$, phase shift = none, vertical shift = *3* units down.

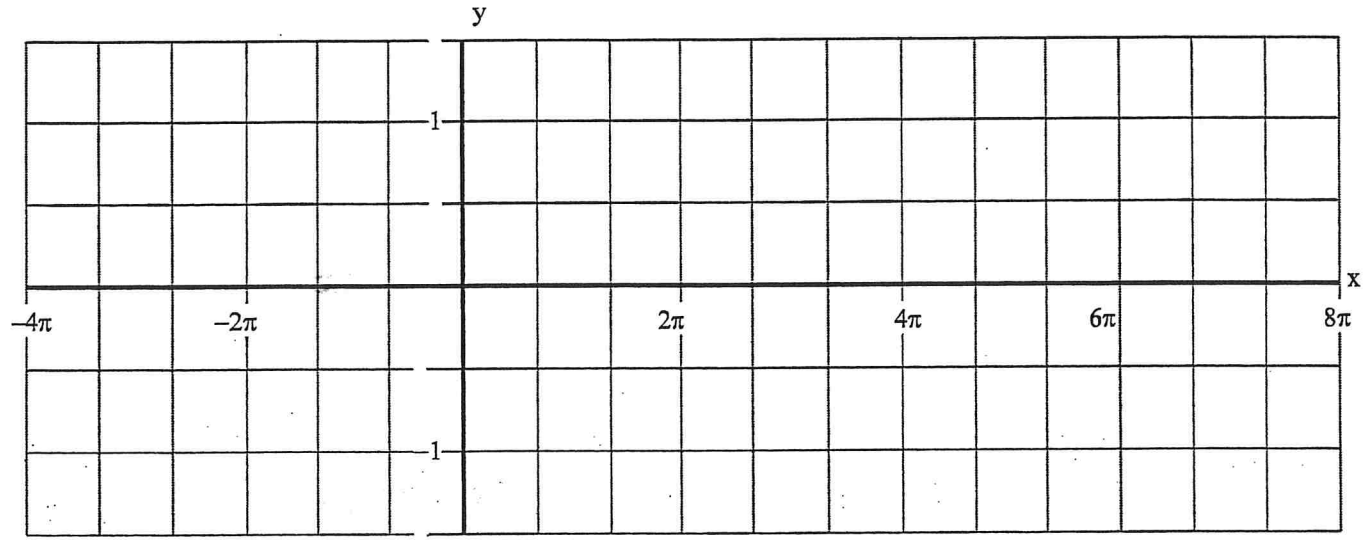
_____

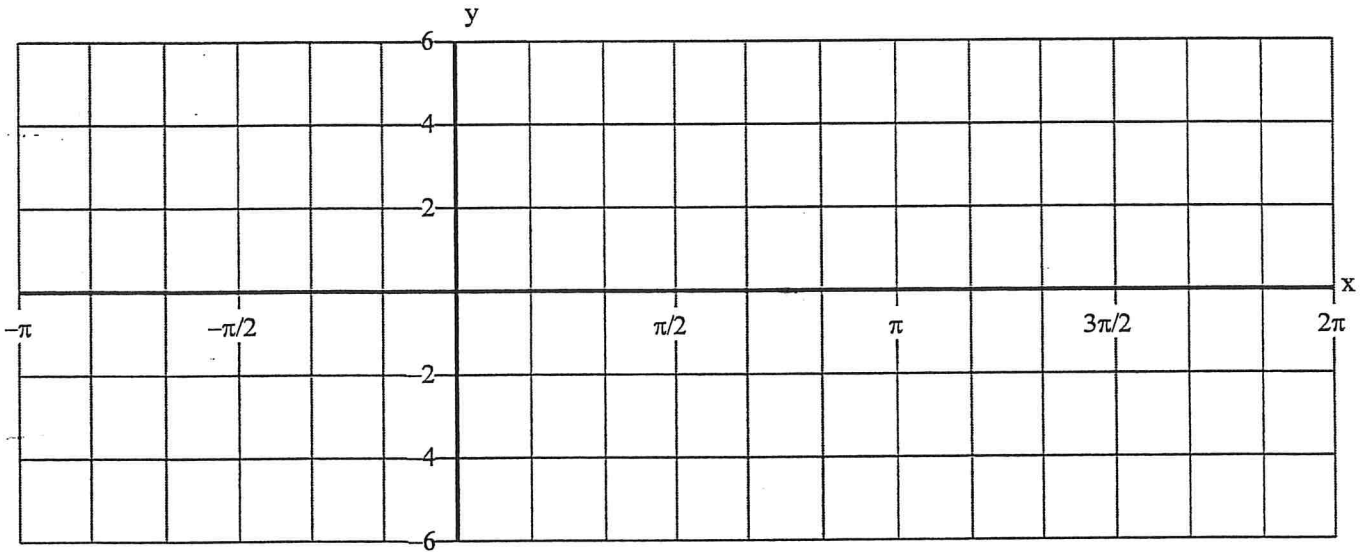
10. Amplitude = *1*, period = 4π, phase shift = $\frac{\pi}{4}$ to the left, vertical shift = *2* units up.

_____


y
3
2
1
x
−π
−π/2
π/2
π
3π/2
2π
−1
−2
−3


y
6
4
2
x
−π
−π/2
π/2
π
3π/2
2π
−2
−4
−6





Worksheet #3 Graphs

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PRECALC I – 4.6-4.8 WORKSHEET II

1. $y=2\sin\left(x-\frac{\pi}{2}\right)$

   a. Compare this graph to the parent function (in words) _____

   b. amplitude = _____ c. period = _____ d. phase shift = _____

   e. vertical shift = _____ f. graph it!

2. Write the equation using $y=\cos x$ and $(x,y)\rightarrow(3x,2y)$.

   a. equation _____

   b. amplitude = _____ c. period = _____

3. Write the equation using $y=\tan x$ with a phase shift of $\frac{\pi}{3}$ to the right and a vertical shift of 2 up.

   a. equation _____ b. amplitude = _____

   c. period = _____ d. $(x,y)\rightarrow$ _____ e. graph it!

4. $y=\frac{1}{2}\sin 8\left(x-\frac{\pi}{4}\right)-5$.

   a. amplitude = _____ b. period = _____

   c. phase shift = _____ d. vertical shift = _____

5. Write the equation using $y=\cos x$ with amplitude = 5, reflected over the x-axis, and a phase shift of $\frac{\pi}{4}$ to the left.

   a. equation _____

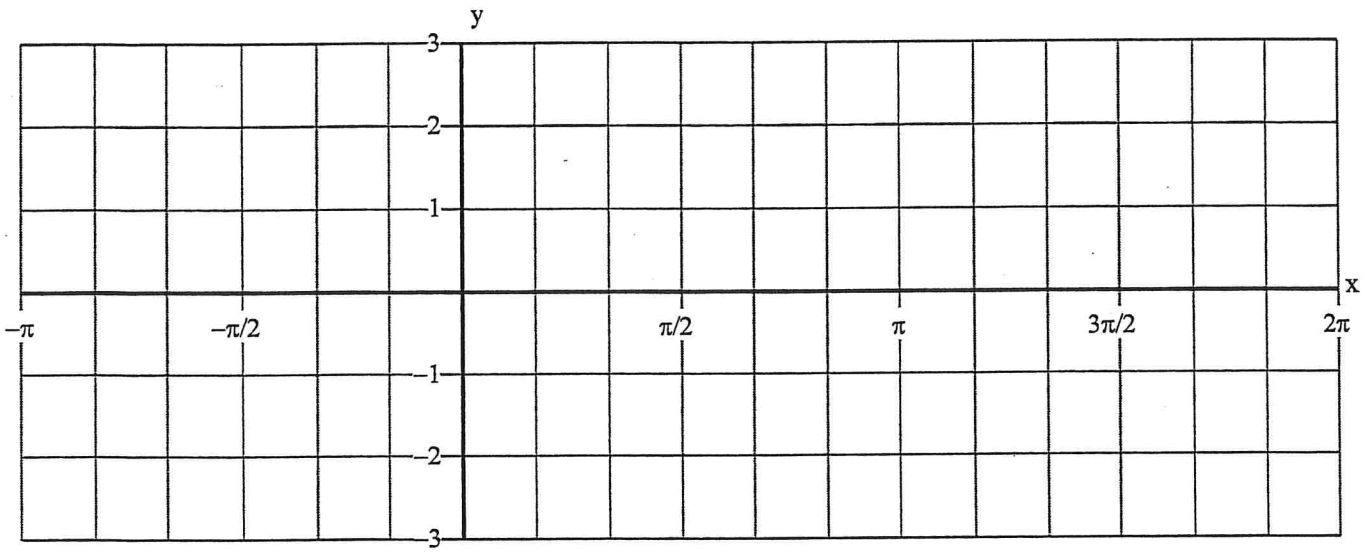
   b. period = _____ c. $(x,y)\rightarrow$ _____

3. The graph of $y = \sin x$ flips over the x-axis, slides up 1 unit, and translates to the left $\frac{\pi}{6}$ units.

   a. Write the rule for this transformation: _____

   b. Write the equation for this transformation: _____

   c. Graph:

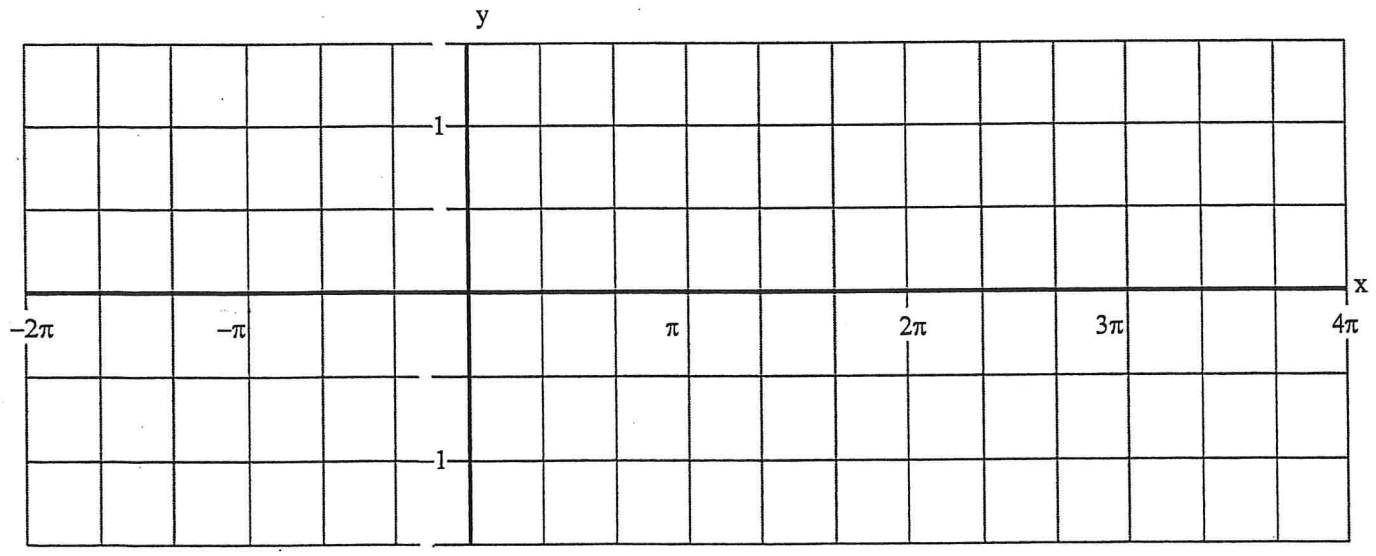


4. The graph of $y = \cos x$ has a period of 4π and an amplitude of $\frac{3}{2}$.

   a. Write the rule for this transformation: _____

   b. Write the equation for this transformation: _____

   c. Graph:



19

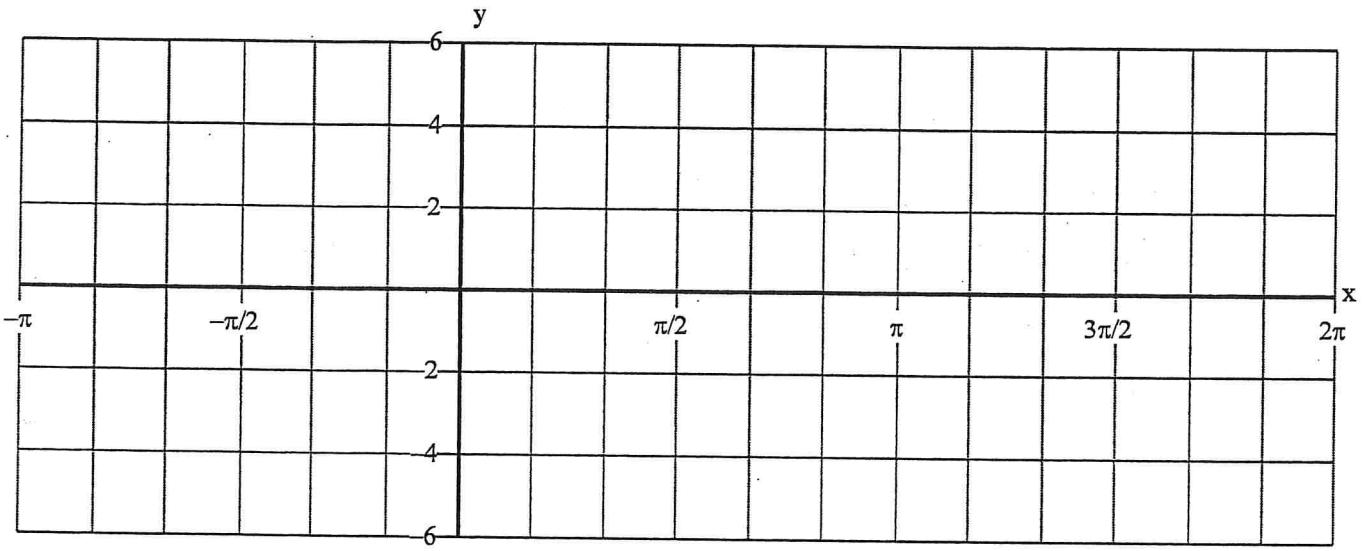
1. $y = \sin x$ $\quad a = 3$ $\quad k = -2$

a. Describe in words what happens to the graph of the parent function: _____

_____

b. Write the equation for this transformation: _____

c. Write the rule for this transformation: _____



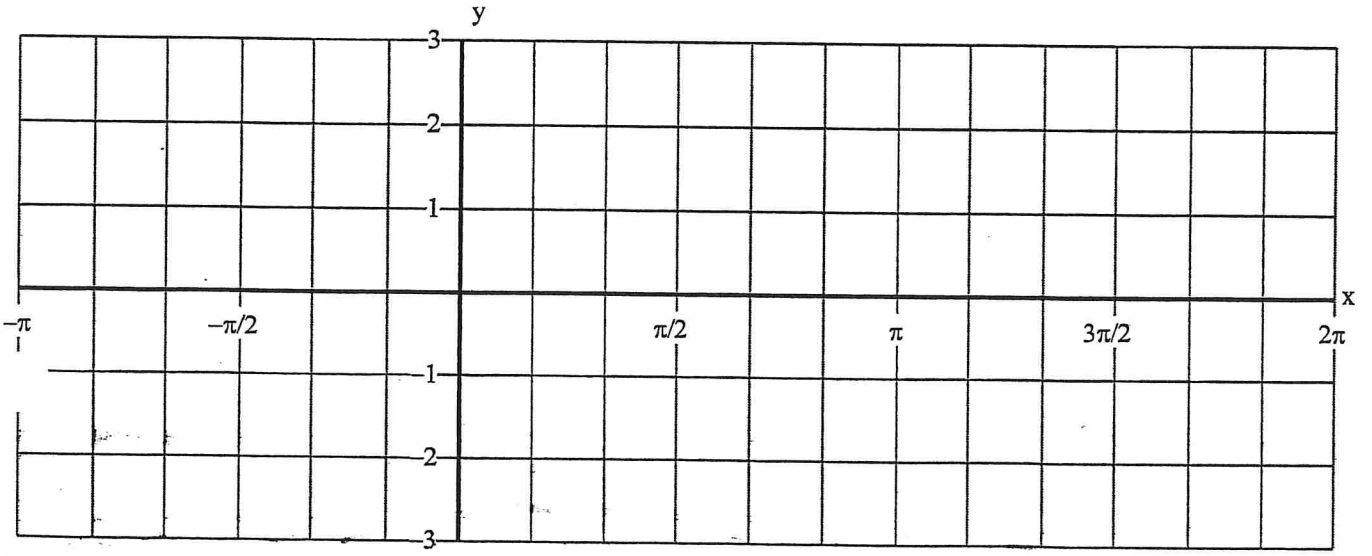
2. $y = \cos x$ $\quad a = -2$ $\quad h = -\pi/3$

a. Describe in words what happens to the graph of the parent function: _____

_____

b. Write the equation for this transformation: _____

c. Write the rule for this transformation: _____



20

PRECALC I – 4.6-4.8 WORKSHEET III

1. $y = \sin\frac{1}{3}(x+\pi)$
   a. amplitude = _____ b. period = _____ c. phase shift = _____

   d. vertical shift = _____ e. graph it!

2. $y = 3\cos(4x) - 3$
   a. amplitude = _____ b. period = _____ c. phase shift = _____

   d. vertical shift = _____ e. graph it!

3. $y = \tan\left(x - \frac{\pi}{2}\right)$
   a. amplitude = _____ b. period = _____ c. phase shift = _____

   d. vertical shift = _____ e. graph it!

4. $y = \cos x$, vertical shift = *2* up, period = π.
   a. give the rule for this transformation _____

   b. give the equation _____

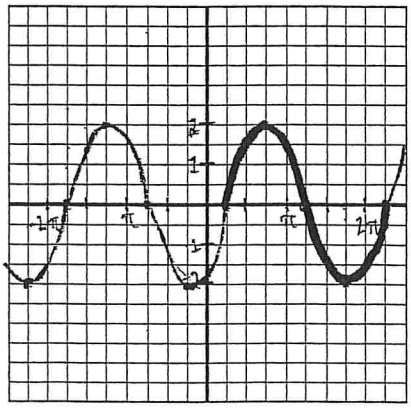
5. $y = \sin x$, amplitude = *4*, phase shift = π to the left.
   a. give the rule for this transformation _____

   b. give the equation _____

6. $y = \tan x$, period = 3π, phase shift = none, vertical shift = 1 down.
   a. give the rule for this transformation _____

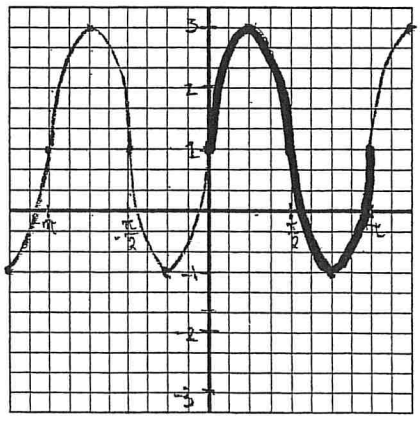
   b. give the equation _____ c. graph it!

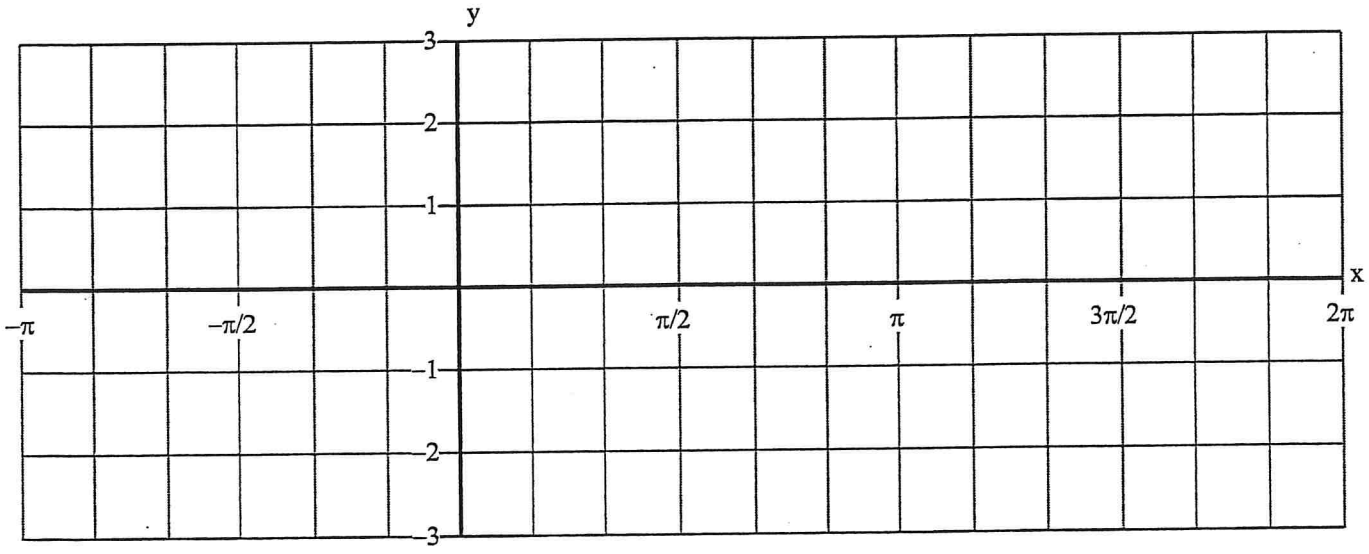
7. Give the equations of the following graphs.

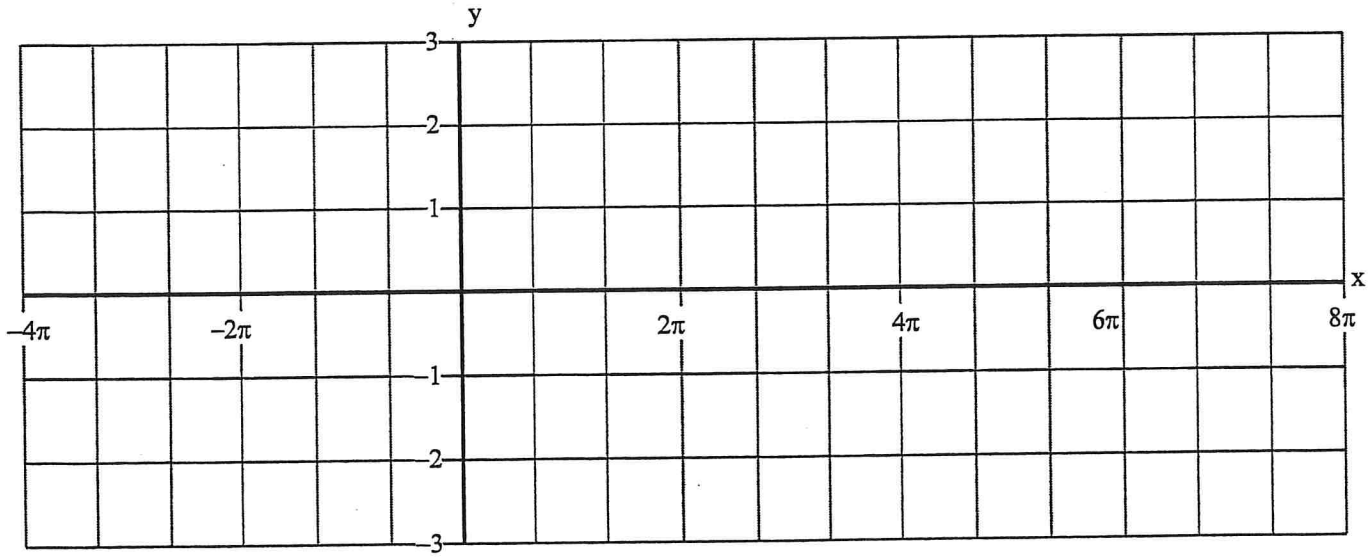


a. _____

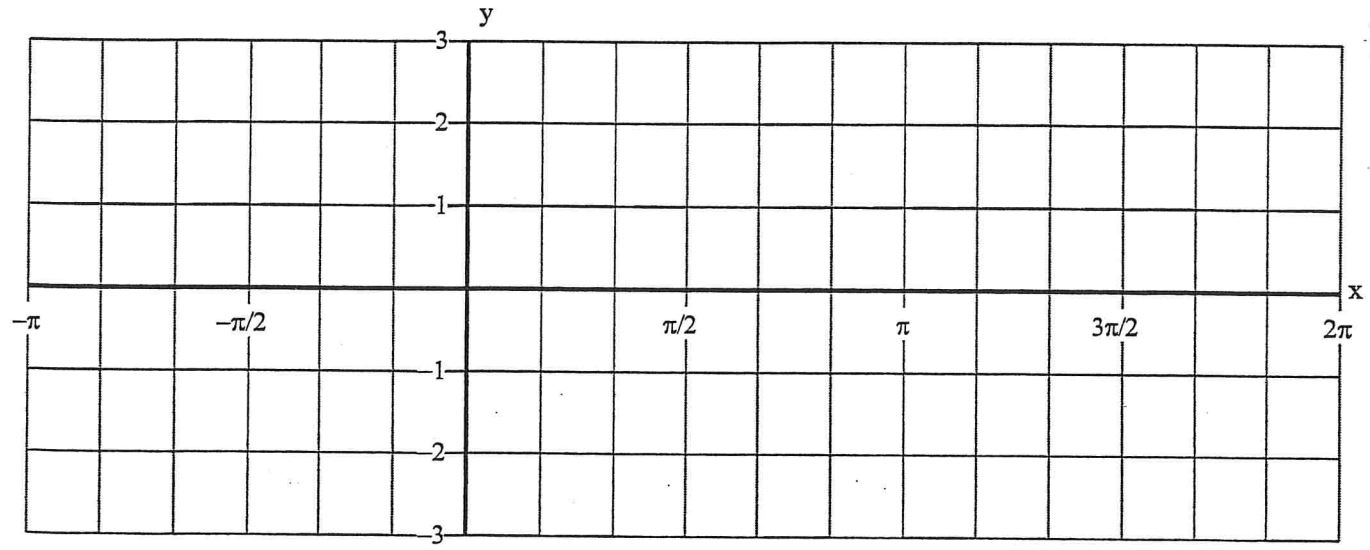
b. _____

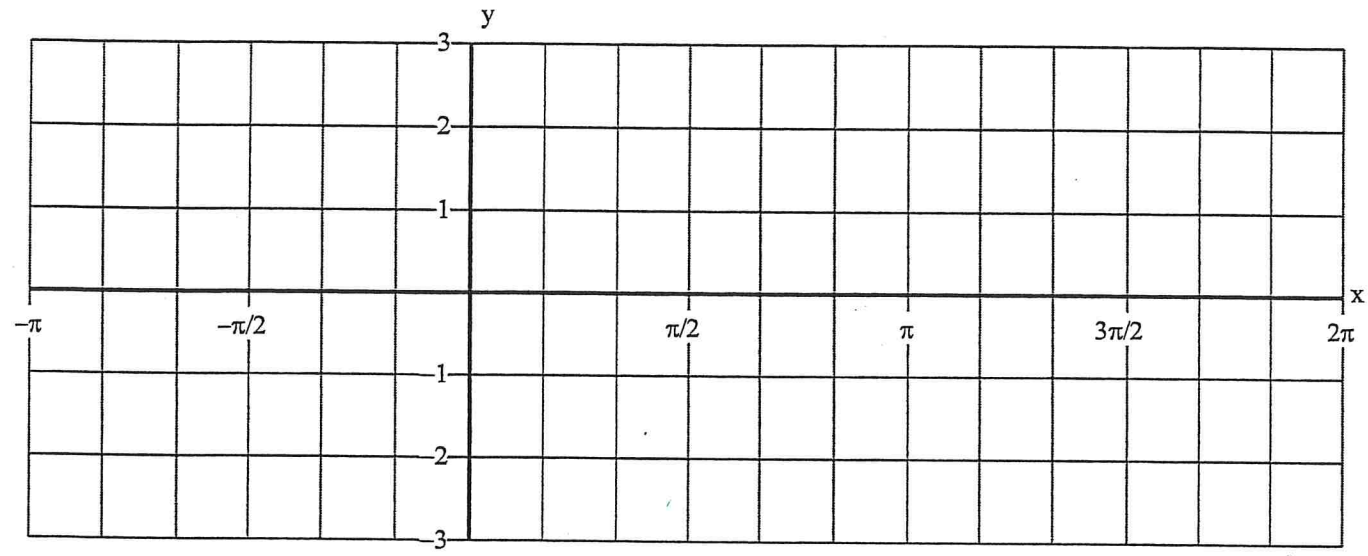






Worksheet #3 Graphs


y
3
2
1
x
−π
−π/2
π/2
π
3π/2
2π
1
2
3


y
3
2
1
x
−π
−π/2
π/2
π
3π/2
2π
1
2
3

Graphs of Sine and Cosine Functions

1. Determine the amplitude: $f(x) = \sin\left(\frac{x}{4} - \pi\right)$

   (a) 1 (b) π (c) π^2 (d) 0 (e) None of these

2. Determine the amplitude: $f(x) = -3\cos\left(\frac{x}{2} + \pi\right)$

   (a) 0 (b) -2π (c) 3π (d) 3 (e) None of these

3. Determine the amplitude: $f(x) = -\frac{2}{3}\sin(4x)$

   (a) $\frac{2}{3}$ (b) $\frac{3}{2}$ (c) 4 (d) $\frac{\pi}{2}$ (e) None of these

4. Determine the amplitude: $f(x) = 4\cos(3x)$

   (a) 3 (b) $\frac{1}{3}$ (c) 4 (d) -4 (e) None of these

22

5. Determine the amplitude: $f(x) = \frac{2}{3}\sin\left(4x - \frac{\pi}{2}\right)$

(a) $\frac{\pi}{2}$ (b) 4 (c) $\frac{2}{3}$ (d) 2π (e) None of these

6. Determine the period: $f(x) = 3\sin(4x - \pi)$

(a) 3π (b) $\frac{\pi}{2}$ (c) 2π (d) $\frac{3\pi}{2}$ (e) None of these

7. Determine the period: $f(x) = -\frac{2}{3}\cos\left(\frac{x}{3} - \frac{1}{2}\right)$

(a) 6π (b) $\frac{2\pi}{3}$ (c) $\frac{2}{3}$ (d) $\frac{1}{2}$ (e) None of these

8. Determine the period: $f(x) = -\frac{1}{2}\sin\left(\frac{3x}{3} - \frac{1}{2}\right)$

(a) $\frac{1}{2}$ (b) $\frac{1}{2}\pi$ (c) $\frac{3\pi}{4}$ (d) $\frac{4\pi}{3}$ (e) None of these

9. Determine the period of the function: $y = \frac{1}{2}\sin\left(\frac{x}{3} - \pi\right)$

(a) $\frac{1}{2}$ (b) $\frac{2\pi}{3}$ (c) 6π (d) 3π (e) None of these

10. Determine the period and amplitude of the function: $f(x) = -7\cos 3x$

11. Determine the period and amplitude of the function: $f(x) = 5\cos\frac{x}{2}$

12. Describe the horizontal shift of the graph of g with respect to the graph of f:

$g(x) = 4\sin\left(2x - \frac{\pi}{3}\right)$ and $f(x) = 4\sin(2x)$

(a) $\frac{\pi}{6}$ units to the left (b) $\frac{\pi}{6}$ units to the right (c) $\frac{2\pi}{3}$ units to the left

(d) $\frac{2\pi}{3}$ units to the right (e) None of these

13. Describe the horizontal shift of the graph of g with respect to the graph of f:

$g(x) = 3\sin\left(2x - \frac{\pi}{4}\right)$ and $f(x) = 3\sin(2x)$

(a) $\frac{\pi}{4}$ units to the left (b) $\frac{\pi}{8}$ units to the right (c) $\frac{\pi}{4}$ units to the right

(d) $\frac{\pi}{8}$ units to the left (e) None of these

14. Describe the horizontal shift of the graph of g with respect to the graph of f:

$g(x) = 4\cos\left(3x + \frac{\pi}{4}\right)$ and $f(x) = 4\cos(3x)$

(a) $\frac{\pi}{4}$ units to the right (b) $\frac{\pi}{4}$ units to the left (c) $\frac{\pi}{12}$ units to the right

(d) $\frac{\pi}{12}$ units to the left (e) None of these

15. Describe the horizontal shift of the graph of g with respect to the graph of f:

$g(x) = 3\cos(\pi x + 3)$ and $f(x) = 3\cos(\pi x)$

(a) $\frac{3}{\pi}$ units to the left (b) $\frac{\pi}{3}$ units to the left (c) $\frac{2\pi}{3}$ units to the right

(d) $\frac{3}{2\pi}$ units to the right (e) None of these

16. Describe the horizontal shift of the graph of g with respect to the graph of f:

$g(x) = \frac{1}{2}\cos\left(\pi x - \frac{\pi}{2}\right)$ and $f(x) = \frac{1}{2}\cos(\pi x)$

(a) $\frac{\pi}{2}$ units to the right (b) $\frac{\pi}{2}$ units to the left (c) $\frac{1}{2}$ units to the right

(d) $\frac{1}{2}$ units to the left (e) None of these

17. Describe the horizontal shift of the graph of g with respect to the graph of f:

$g(x) = 4\sin\left(3x - \frac{3}{2}\pi\right)$ and $f(x) = 4\sin 3x$

(a) $\frac{3\pi}{2}$ units to the left (b) $\frac{3\pi}{2}$ units to the right (c) $\frac{\pi}{2}$ units to the left

(d) $\frac{\pi}{2}$ units to the right (e) None of these

18. Describe the shifts in the graph of g with respect to the graph of f:

$g(x) = 1 + \cos\left(2x + \frac{\pi}{2}\right)$ and $f(x) = \cos 2x$

(a) $\frac{\pi}{2}$ right, down 1 (b) $\frac{\pi}{4}$ right, up 1 (c) $\frac{\pi}{4}$ left, up 1

(d) $\frac{\pi}{2}$ left, up 1 (e) None of these

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19. Describe the shifts in the graph of g with respect to the graph of f:

$g(x) = -3 + \sin\left(4x + \frac{\pi}{2}\right)$ and $f(x) = \sin(4x)$

(a) $\frac{\pi}{8}$ left, 3 down (b) $\frac{\pi}{8}$ right, 3 down (c) $\frac{\pi}{2}$ left, 3 down

(d) $\frac{\pi}{2}$ right, 3 up (e) None of these

20. Describe the shifts in the graph of g with respect to the graph of f:

$g(x) = 2 - \sin\left(3x - \frac{\pi}{4}\right)$ and $f(x) = -\sin(3x)$

(a) $\frac{\pi}{4}$ right, 2 down (b) $\frac{\pi}{12}$ left, 2 down (c) $\frac{\pi}{12}$ right, 2 up

(d) $\frac{\pi}{4}$ left, 2 up (e) None of these

21. Describe the shifts in the graph of g with respect to the graph of f:

$g(x) = 1 - \cos\left(\frac{2x}{\pi} - \pi\right)$ and $f(x) = -\cos\frac{2x}{\pi}$

(a) π right, 1 up (b) $\frac{1}{2}$ right, 1 up (c) $\frac{2}{\pi}$ left, 1 down

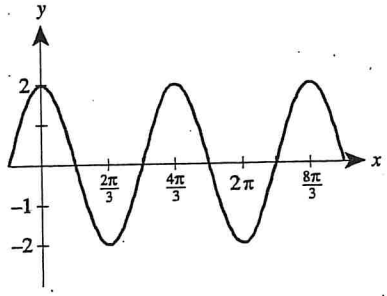
(d) $\frac{\pi^2}{2}$ right, 1 up (e) None of these

22. Match the graph with the correct function.

(a) $y = 2\sin\frac{3x}{2}$ (b) $y = 2\cos\frac{3x}{2}$

(c) $y = 2\sin\frac{2x}{3}$ (d) $y = 2\cos\frac{2x}{3}$

(e) None of these

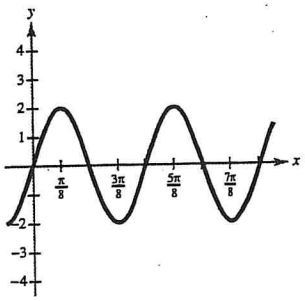


23. Match the graph with the correct function.

(a) $y = 4\sin 2x$ (b) $y = 2\sin 4x$

(c) $y = 4\cos 4x$ (d) $y = 2\cos 2x$

(e) None of these



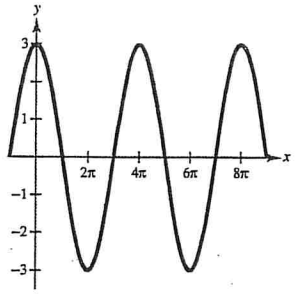
25

24. Match the graph with the correct equation.

(a) $y = 3\cos\left(\frac{x}{2}\right)$ (b) $y = 3\sin\left(\frac{x}{2}\right)$

(c) $y = 3\cos 2x$ (d) $y = 3\sin 2x$

(e) None of these

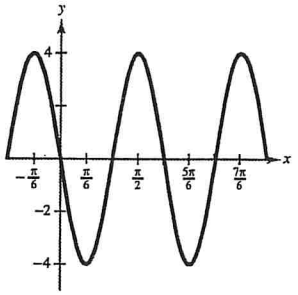


25. Match the graph with the correct equation.

(a) $y = 4\cos\left(2x - \frac{\pi}{3}\right)$ (b) $y = 4\sin\left(2x - \frac{\pi}{3}\right)$

(c) $y = -4\sin\left(3x - \frac{\pi}{2}\right)$ (d) $y = 4\cos\left(3x + \frac{\pi}{2}\right)$

(e) None of these

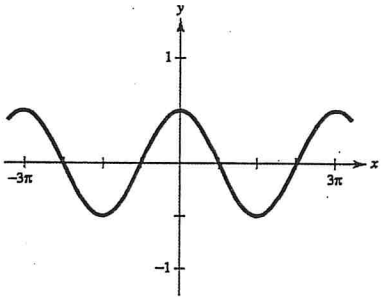


26. Match the graph with the correct function.

(a) $y = \frac{1}{2}\cos\left(\frac{2x}{3}\right)$ (b) $y = \frac{1}{2}\sin\left(\frac{2x}{3}\right)$

(c) $y = \frac{1}{2}\cos\left(\frac{3x}{2}\right)$ (d) $y = \frac{1}{2}\sin\left(\frac{3x}{2}\right)$

(e) None of these

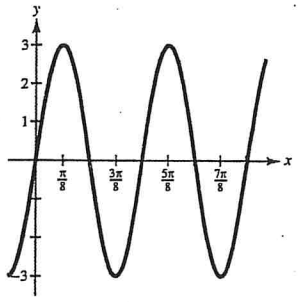


27. Match the graph with the correct function.

(a) $y = 3\sin 4x$ (b) $y = 3\sin\left(\frac{x}{4}\right)$

(c) $y = 3\cos 4x$ (d) $y = 3\cos\left(\frac{x}{4}\right)$

(e) None of these



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28. Match the graph with the correct function.

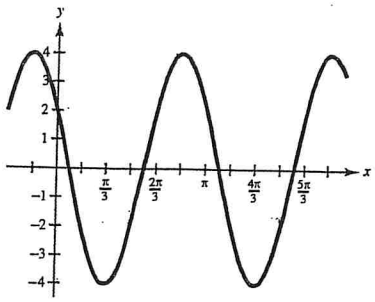
(a) $y = 4\cos\left(3x - \frac{\pi}{2}\right)$

(b) $y = 4\cos\left(x + \frac{\pi}{6}\right)$

(c) $y = 4\sin\left(2x - \frac{\pi}{3}\right)$

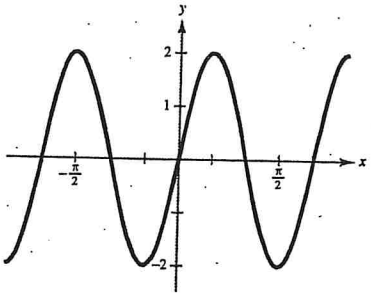
(d) $y = 4\cos\left(2x + \frac{\pi}{3}\right)$

(e) None of these

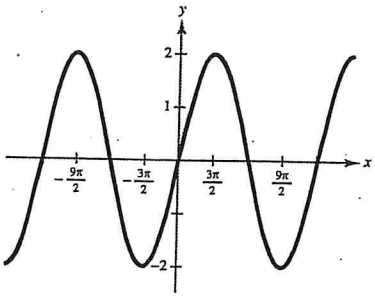


29. Match the function with the correct graph: $y = 2\sin 3x$

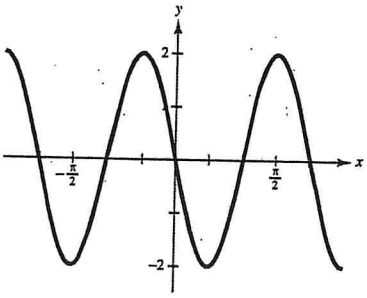
(a)



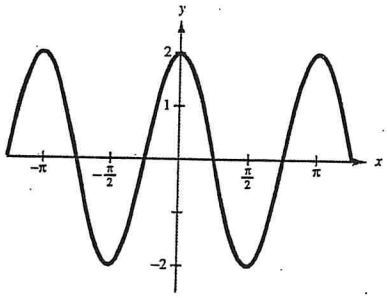
(b)



(c)



(d)

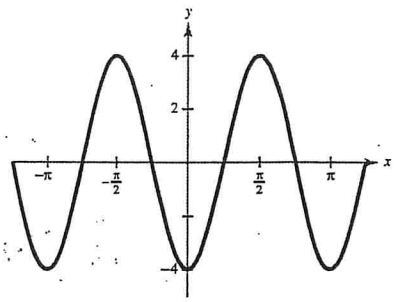


(e) None of these

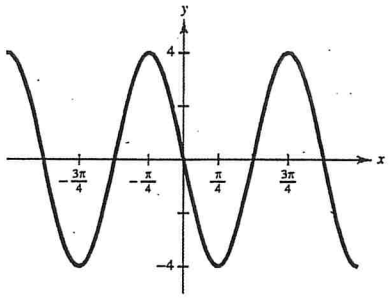
27

30. Match the function with the correct graph: $y = -4\cos\frac{1}{2}x$

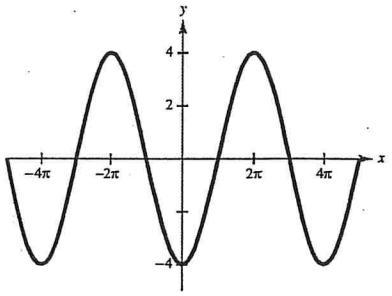
(a)



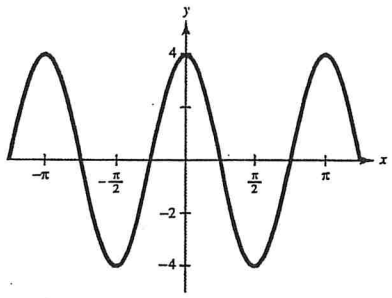
(b)



(c)



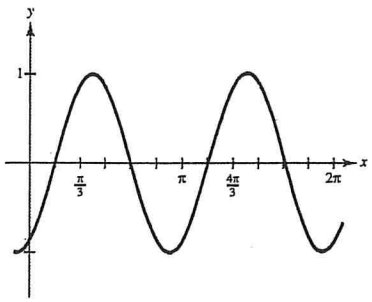
(d)



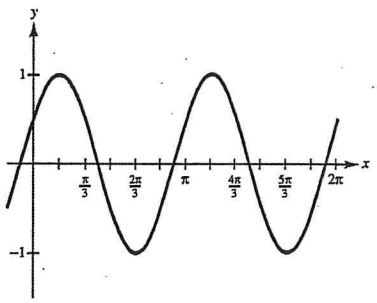
(e) None of these

31. Match the function with the correct graph: $y = \cos\left(2x - \frac{\pi}{3}\right)$

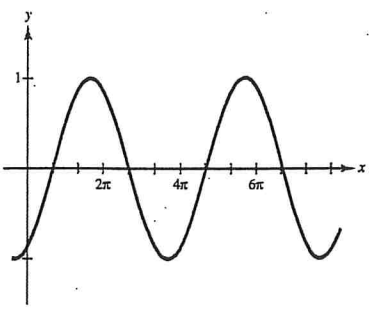
(a)



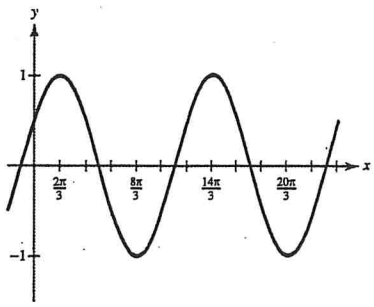
(b)



(c)



(d)

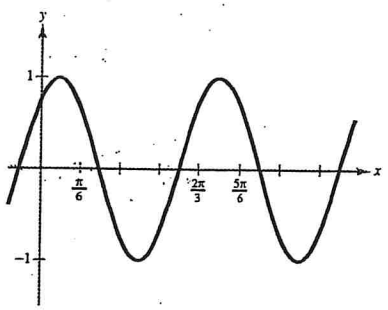


(e) None of these

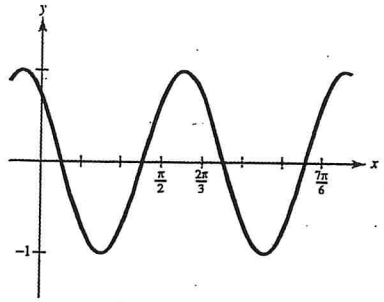
28

32. Match the function with the correct graph: $y = \sin\left(3x - \frac{\pi}{4}\right)$

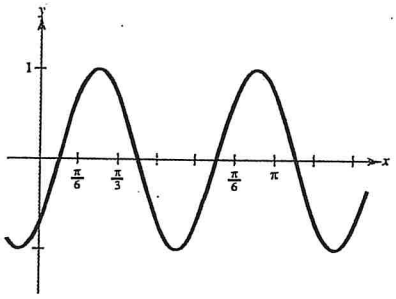
(a)



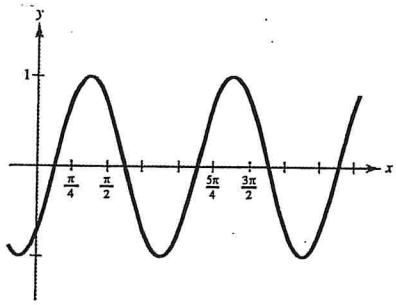
(b)



(c)



(d)



(e) None of these

33. Sketch by hand the graph of the function: $f(x) = 4\sin(2x - \pi)$

Write the equation of a sine function that has the given characteristics.

1) Amplitude: 5
Period: 3π
Phase Shift: $\frac{\pi}{3}$

A) $y = 5\sin(\frac{2}{3}x + \frac{2}{9}\pi)$ B) $y = 5\sin(\frac{3}{2}x + \frac{2}{9}\pi)$ C) $y = 5\sin(\frac{2}{3}x - \frac{2}{9}\pi)$ D) $y = 5\sin(3x + \frac{\pi}{3})$

2) Amplitude: 5
Period: 6π
Phase Shift: $-\frac{\pi}{6}$

A) $y = 5\sin(\frac{1}{3}x + \frac{1}{18}\pi)$ B) $y = 5\sin(\frac{1}{3}x - \frac{1}{18}\pi)$

C) $y = 5\sin(6x - \frac{\pi}{6})$ D) $y = 5\sin(3x - \frac{1}{18}\pi)$

3) Amplitude: 2
Period: π
Phase Shift: -4

A) $y = 2\sin(\frac{1}{2}x - 8)$ B) $y = \sin(2x + 4)$ C) $y = 2\sin(2x + 8)$ D) $y = 2\sin(x - 4)$

4) Amplitude: 3
Period: π
Phase Shift: $\frac{7}{2}$

A) $y = \sin(3x + 7)$ B) $y = 3\sin(2x + \frac{7}{2})$ C) $y = 3\sin(\frac{1}{2}x - 14)$ D) $y = 3\sin(2x - 7)$

Find the phase shift of the function.

1) $y = 5\sin(x - \frac{\pi}{4})$

A) 5 units up B) $\frac{\pi}{4}$ units to the right C) $\frac{\pi}{4}$ units to the left D) 5 units down

2) $y = 4\cos(x + \frac{\pi}{4})$

A) $\frac{\pi}{4}$ units to the left B) 4 units down C) 4 units up D) $\frac{\pi}{4}$ units to the right

3) $y = 5\sin(4x - \frac{\pi}{2})$

A) $\frac{\pi}{2}$ units to the right B) 5π units up C) 4π units down D) $\frac{\pi}{8}$ units to the right

4) $y = -5\cos(8x + \pi)$

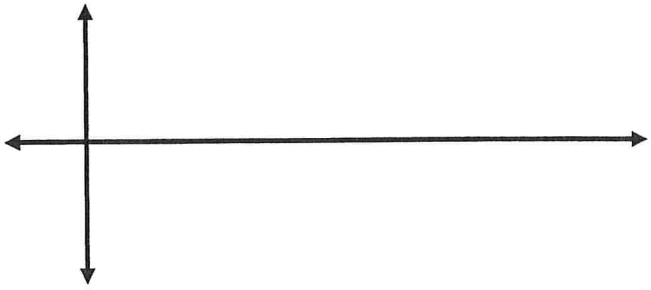
A) $\frac{\pi}{5}$ units to the left B) 8π units to the right C) $\frac{\pi}{8}$ units to the left D) 5π units to the right

5) $y = -5\sin(\frac{1}{4}x - \frac{\pi}{4})$

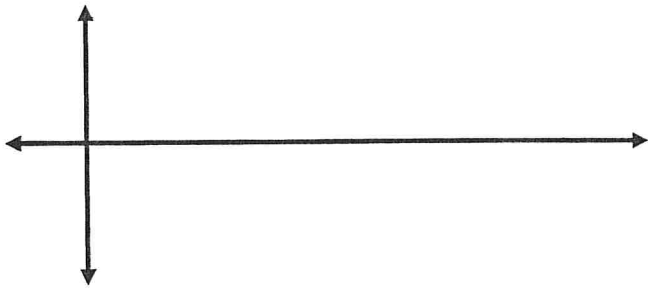
A) $\frac{\pi}{5}$ units to the left B) $\frac{\pi}{16}$ units to the left C) π units to the right D) $\frac{\pi}{4}$ units to the right

4-4: Graphing Sine and Cosine Functions WS3 CP Precalculus

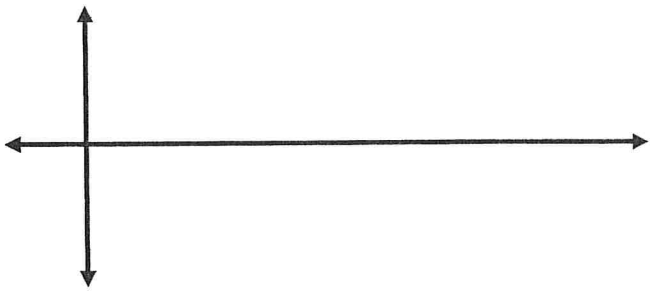
1. $y = \sin x$
   a. Graph the function to the right
   b. Domain: _____
   c. Range: _____
   d. Period: _____
   e. Amplitude: _____
   f. Maximum: _____ Minimum: _____
   g. Increasing: _____ Decreasing: _____



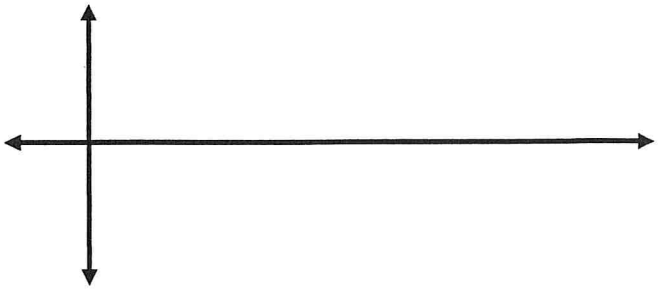
2. $y = -\sin x$
   a. Graph the function to the right
   b. Domain: _____
   c. Range: _____
   d. Period: _____
   e. Amplitude: _____
   f. Describe how the function is transformed.



3. $y = 3\sin x$
   a. Graph the function to the right
   b. Domain: _____
   c. Range: _____
   d. Period: _____
   e. Amplitude: _____
   f. Describe how the function is transformed.

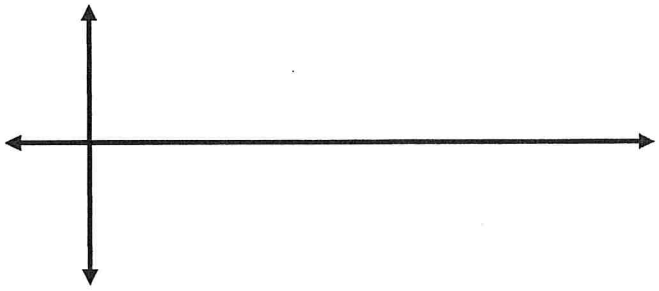


4. $y = 2\sin(2x)$



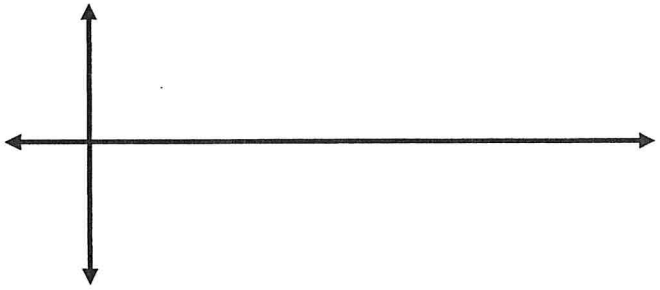
   a. Graph the function to the right
   b. Domain: _____
   c. Range: _____
   d. Period: _____
   e. Amplitude: _____
   f. Describe how the function is transformed.

5. $y = -4\sin\left(\frac{x}{3}\right)$



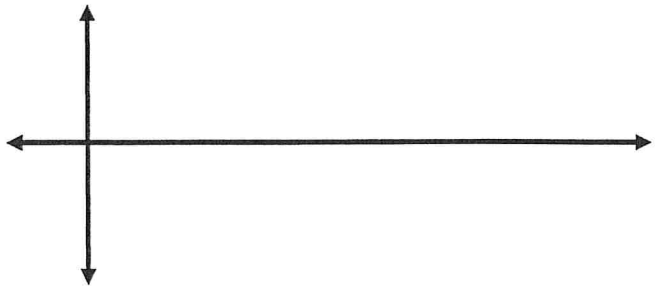
   a. Graph the function to the right
   b. Domain: _____
   c. Range: _____
   d. Period: _____
   e. Amplitude: _____
   f. Describe how the function is transformed.

6. $y = \cos x$



   a. Graph the function to the right
   b. Domain: _____
   c. Range: _____
   d. Period: _____
   e. Amplitude: _____
   f. Maximum: _____ Minimum: _____
   g. Increasing: _____ Decreasing: _____

7. $y = -\cos x$



a. Graph the function to the right

b. Domain: _____

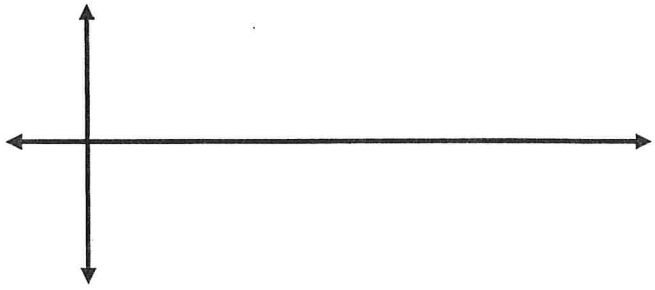
c. Range: _____

d. Period: _____

e. Amplitude: _____

f. Describe how the function is transformed.

8. $y = -3\cos x$



a. Graph the function to the right

b. Domain: _____

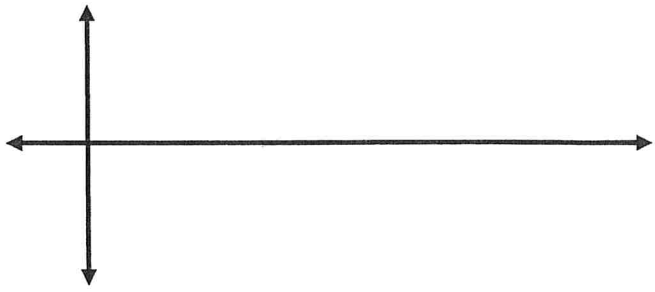
c. Range: _____

d. Period: _____

e. Amplitude: _____

f. Describe how the function is transformed.

9. $y = -3\cos 3x$



a. Graph the function to the right

b. Domain: _____

c. Range: _____

d. Period: _____

e. Amplitude: _____

f. Describe how the function is transformed.

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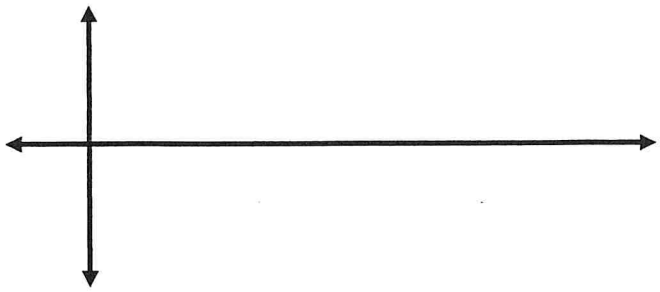
10. $y = \frac{1}{2}\cos 4x$



a. Graph the function to the right

b. Domain: _____

c. Range: _____

d. Period: _____

e. Amplitude: _____

f. Describe how the function is transformed.