

CHAPTER 5

Trigonometric Functions and Graphs

- (i) Graph sine, cosine and tangent function
- $$y = \sin x$$
- $$y = \cos x$$
- $$y = \tan x$$

Characteristics:

- « domain and range
- « amplitude
- « period
- « zeros

- (ii) Transformations of the sine and cosine function

$$y = a \sin b(x - c) + d$$

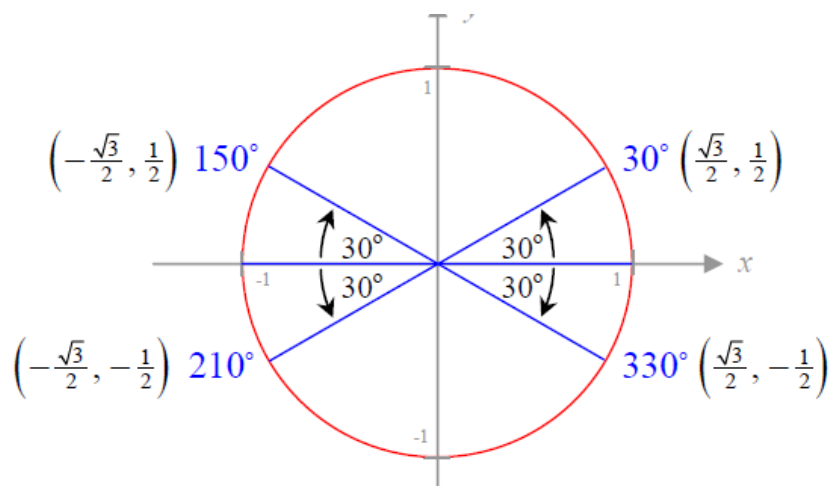
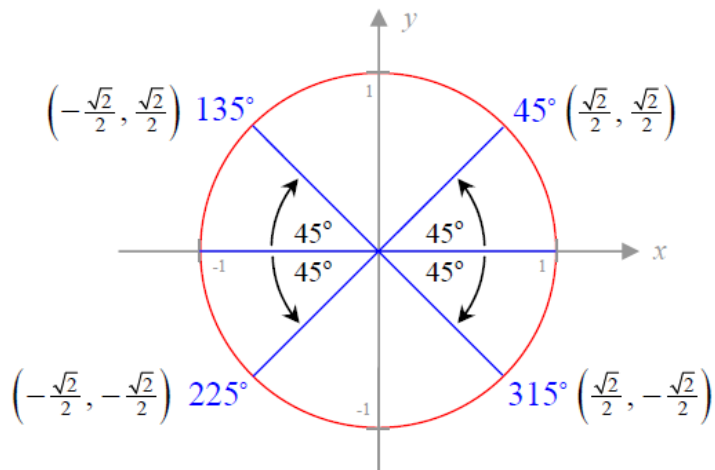
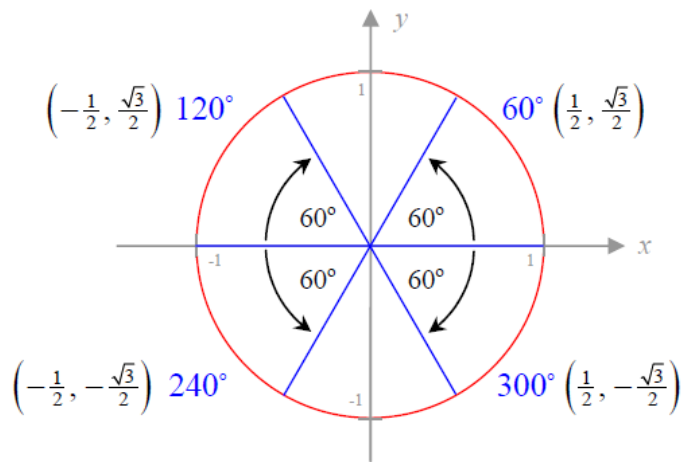
$$y = a \cos b(x - c) + d$$

- (iii) Solve first and second degree trigonometric equations algebraically and graphically.

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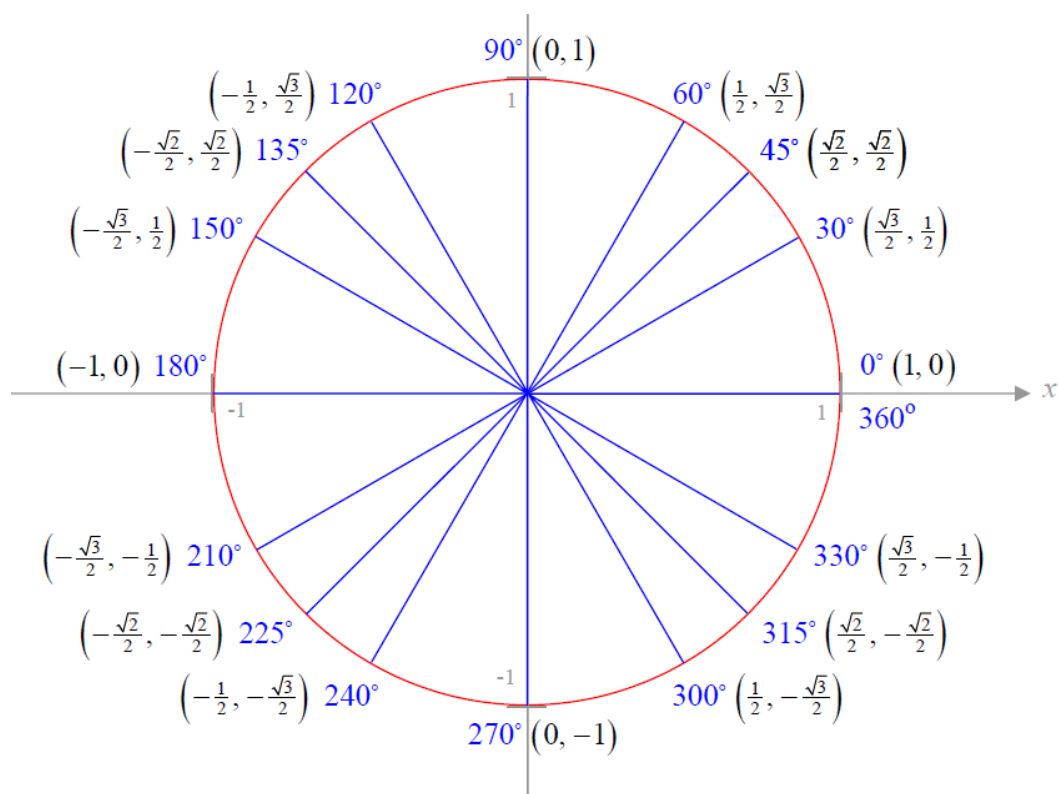
Lesson 5.1 Graphing sine and cosine function

Special Angles on the Unit Circle



Lesson 5.1 Graphing sine and cosine function

Summary:



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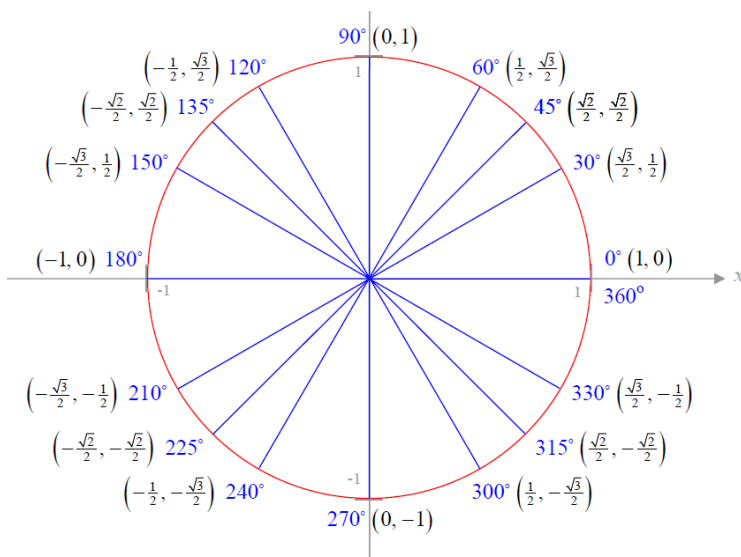
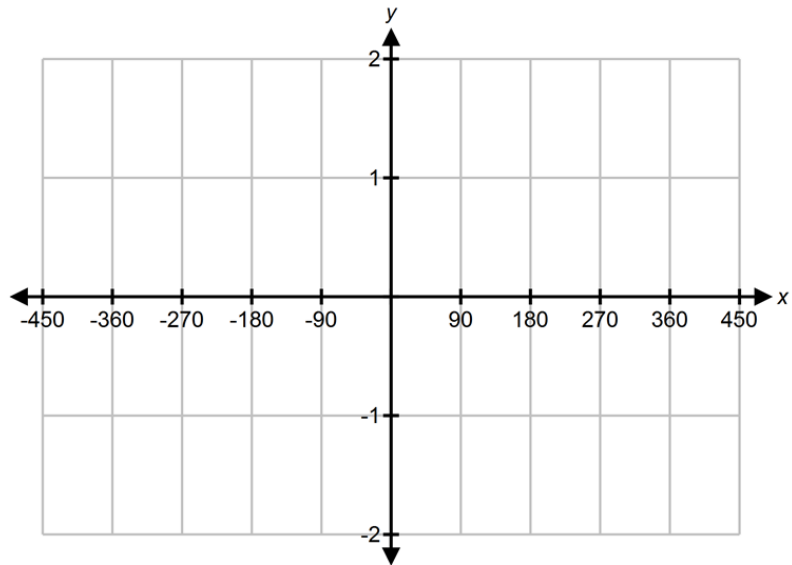
Lesson 5.1 Graphing sine and cosine function

Lesson 5.1 Sketch the graph of $y = \sin \theta$ and $y = \cos \theta$.

A. Graph the function $y = \sin \theta$

Choose 5 key points associated with each graph \longrightarrow determine the characteristics of the graph

angle θ	$y = \sin \theta$



The sine function

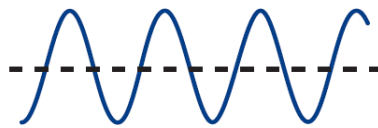


y-coordinate of the point

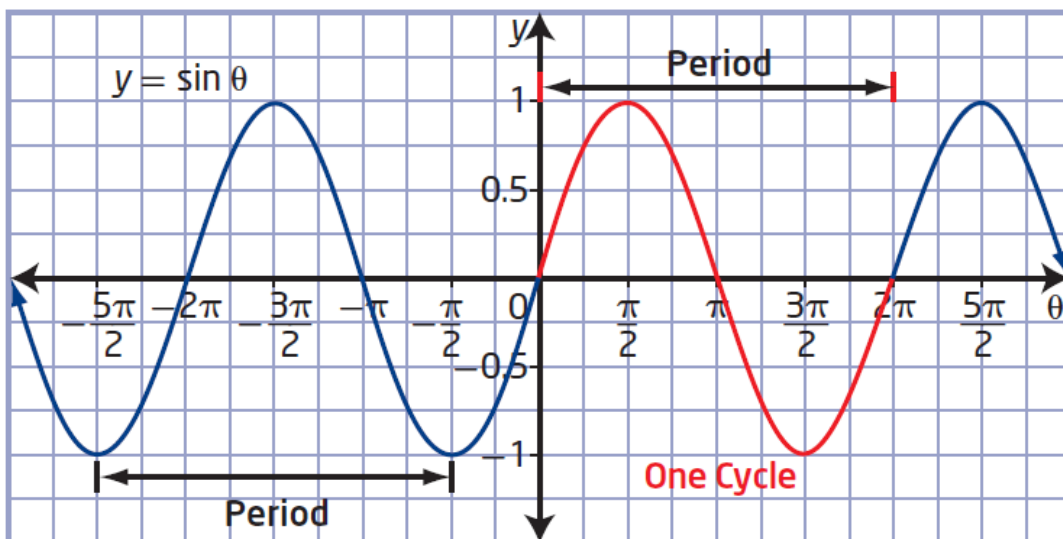
Lesson 5.1 Graphing sine and cosine function

periodic function: a function that repeats itself over regular intervals (cycles) of its domain.

sinusoidal function: a periodic function that looks like waves; oscillates repeatedly up and down from a centre line



Characteristics:

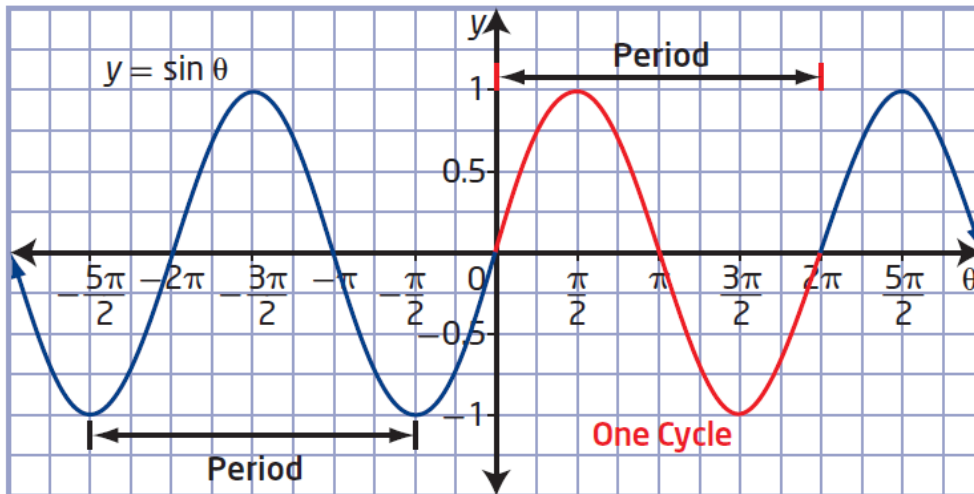


one cycle: \longrightarrow

(i) period: the portion of the graph which illustrates one full cycle of the function.

Lesson 5.1 Graphing sine and cosine function

Characteristics cont'd:



(ii) Maximum/Minimum

(iii) Domain/Range:

(iv) Horizontal Central Axis : the horizontal line which is halfway between the local maximum and local minimum.



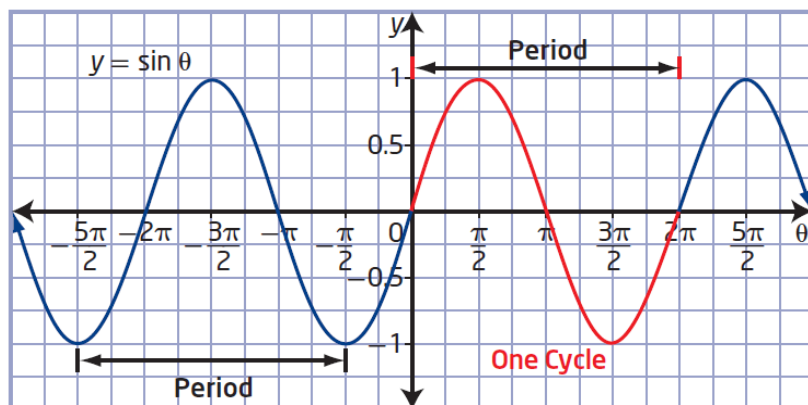
Equation of the Sinusoidal Axis

Midline

→

Lesson 5.1 Graphing sine and cosine function

Characteristics cont'd:



(v) Amplitude: vertical distance from the sinusoidal axis to a local maximum or minimum

(vi) x and y-intercepts

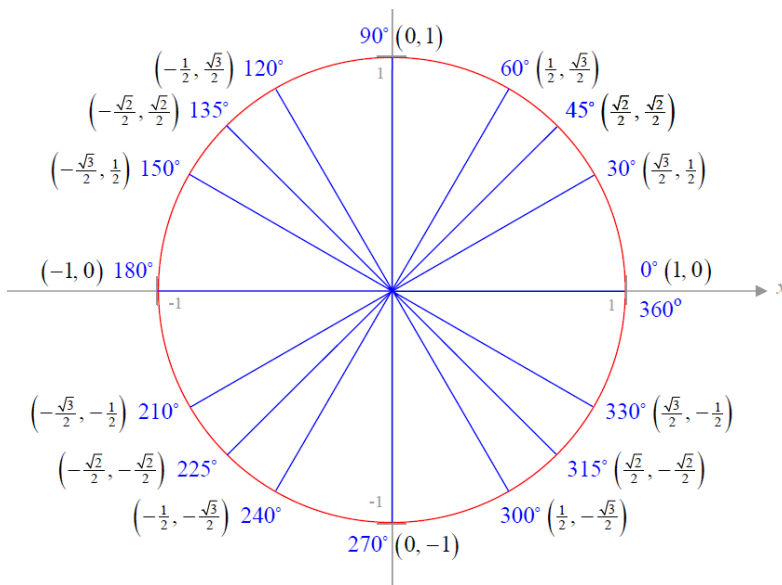
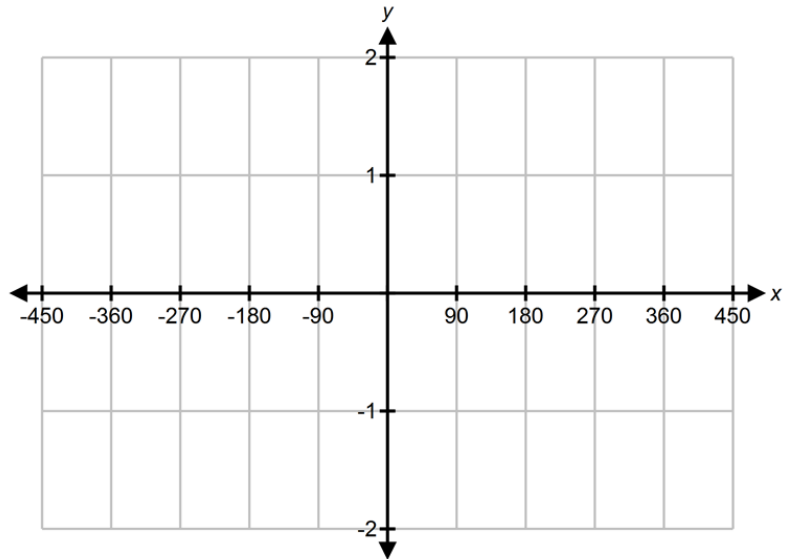
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Lesson 5.1 Graphing sine and cosine function

B. Graph the function $y = \cos \theta$

Choose 5 key points associated with each graph \longrightarrow determine the characteristics of the graph

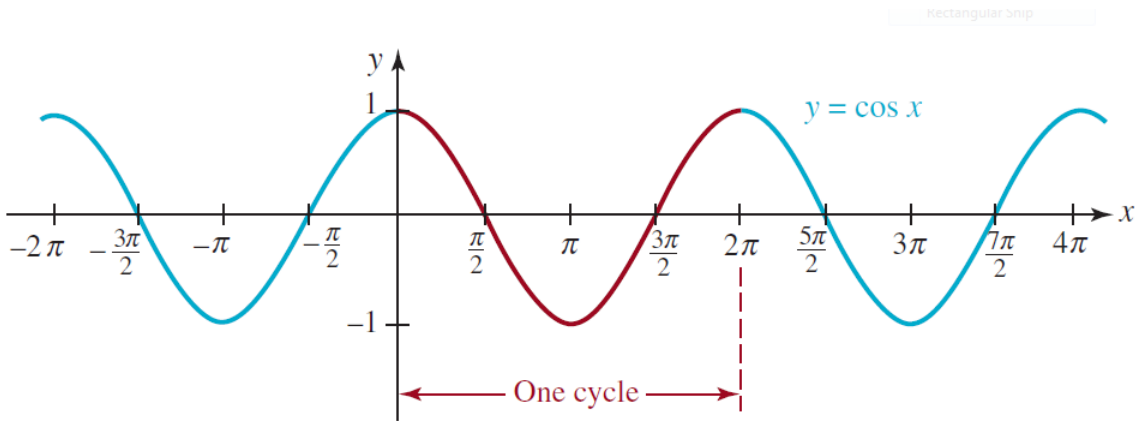
angle θ	$y = \cos \theta$



The cosine function
 \downarrow
 the x-coordinate of the point

Lesson 5.1 Graphing sine and cosine function

Characteristics:



one cycle: \longrightarrow

(i) Maximum/Minimum:

(ii) Domain/Range:

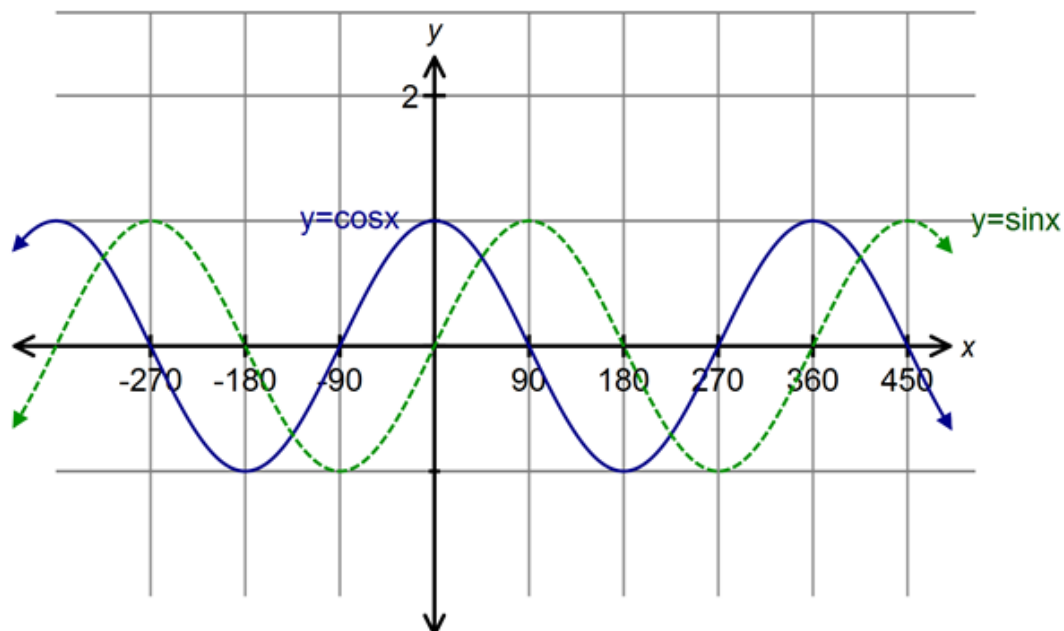
(iii) Horizontal Central Axis:
(Equation of the Sinusoidal Axis)

(iv) Amplitude:

(v) x and y-intercepts

Lesson 5.1 Graphing sine and cosine function

Compare the graph of $y = \sin \theta$ to $y = \cos \theta$.



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Transformations: Vertical and Horizontal Stretches

$$y = a \sin x$$

$$y = a \cos x$$

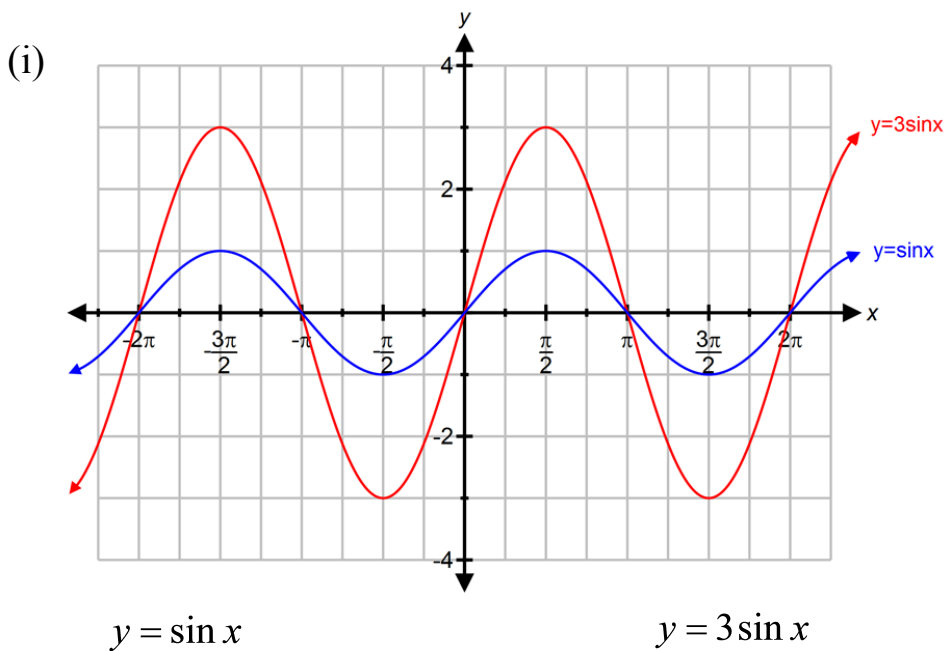
$$y = \sin bx$$

$$y = \cos bx$$

Vertical Stretch affects the _____
|a|

Example 1

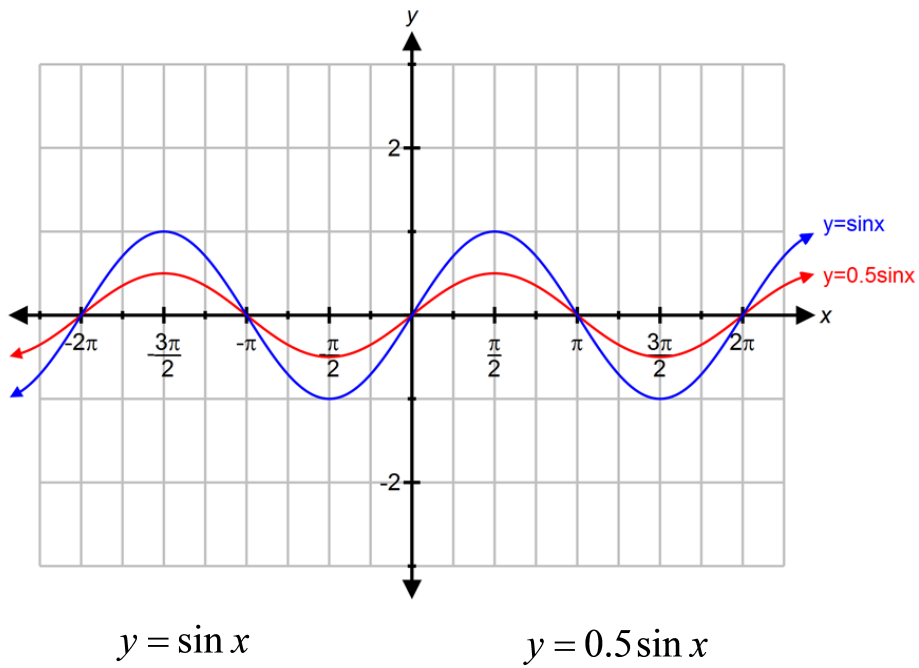
Identify the amplitude for each function.



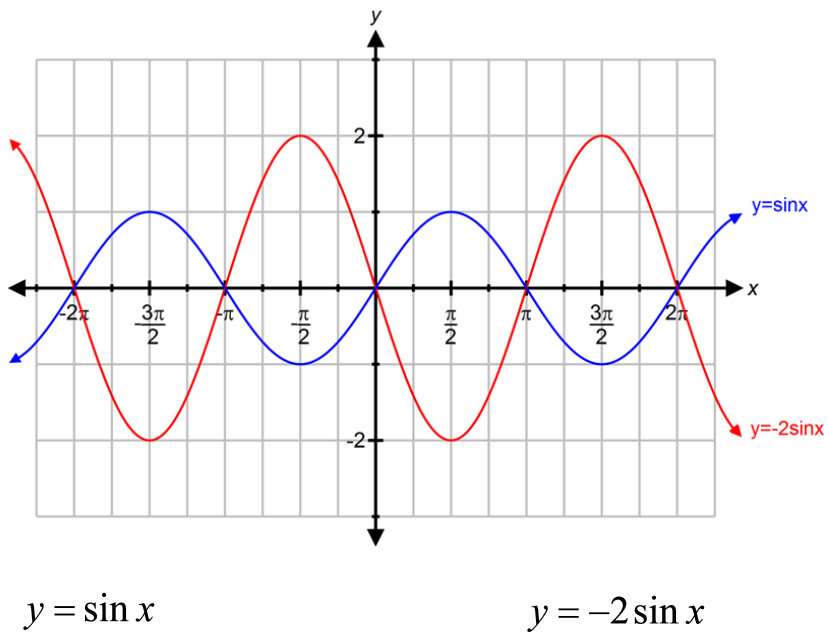
Lesson 5.1 Graphing sine and cosine function

Example 1 cont'd

(ii)



(iii)

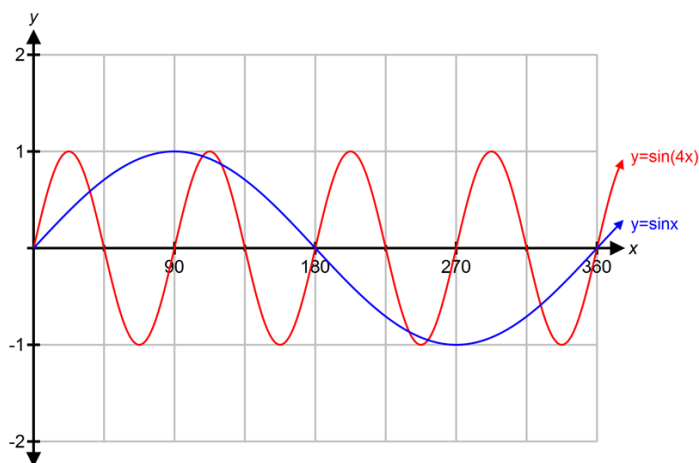


Lesson 5.1 Graphing sine and cosine function

Horizontal Stretch affects the _____
 $\frac{1}{|b|}$

Example 2

Identify the horizontal stretch and the period for each function.



$$y = \sin x$$

$$b =$$

period:

$$y = \sin 4x$$

$$b =$$

period:

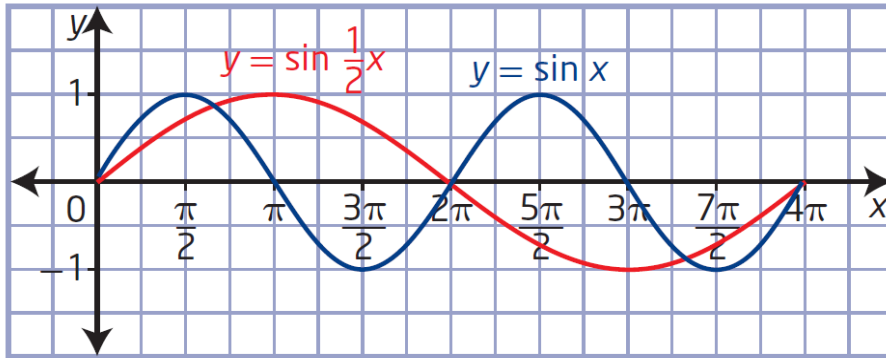
Solve an inequality → to determine the length of the cycle and the key points (max,min,x-ints, hits SA)

→

Lesson 5.1 Graphing sine and cosine function

Example 3 Graph the functions $y = \sin x$ }
 $y = \sin \frac{1}{2}x$ }

What is the period of $y = \sin \frac{1}{2}x$?



$$y = \sin x$$

b=

period:

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

b=

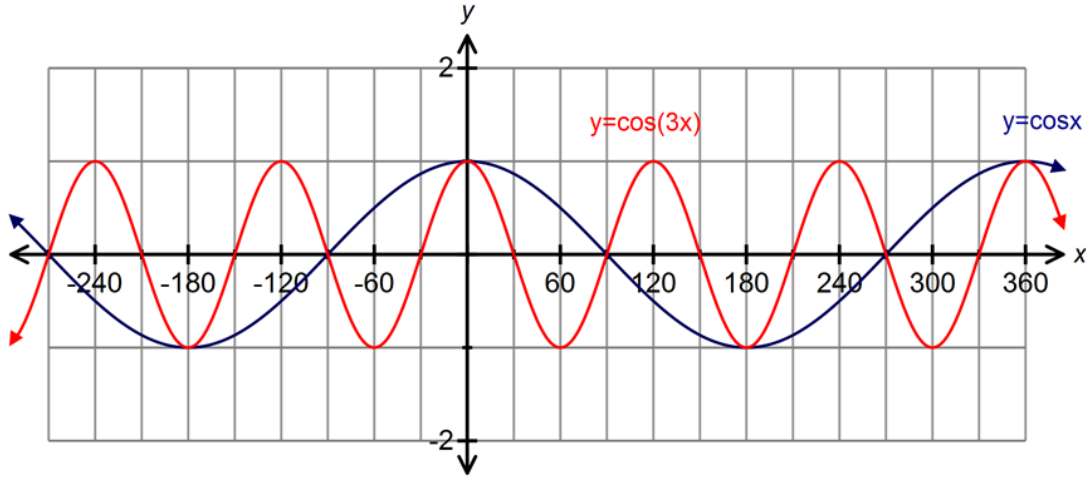
period:

Solve an inequality

→

Lesson 5.1 Graphing sine and cosine function

Example 4: Graph the functions $y = \cos x$ } What is the period
 $y = \cos 3x$ } of $y = \cos 3x$?



$$y = \cos x$$

$$b =$$

period:

$$y = \cos 3x$$

$$b =$$

period:

Solve an inequality

→

Lesson 5.1 Graphing sine and cosine function

Example 5: What is the period of $y = \cos \frac{3}{2}x$?

Example 6: What is the period of $y = \cos(-4x)$?

y=

→

Lesson 5.1 Graphing sine and cosine function

Example 7

Sketch the graph of $y = 3 \cos 2x$ for at least one cycle.

Determine

- the amplitude
- period
- maximum and minimum values
- x and y-intercepts
- domain and range.

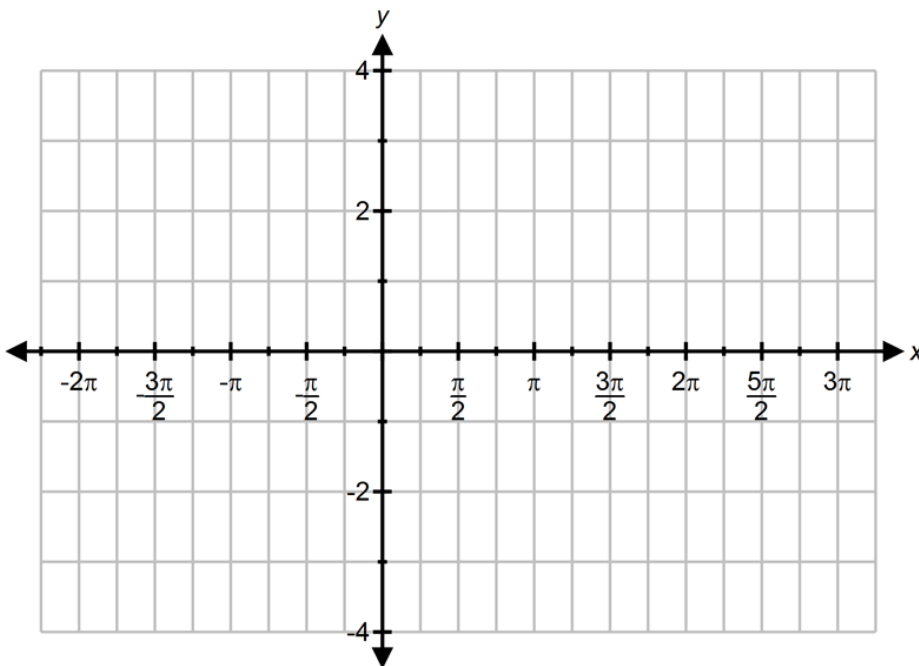
Method 1: Use Mapping Rule

$(x, y) \rightarrow$

x	y
0	
$\frac{\pi}{2}$	
π	
$\frac{3\pi}{2}$	
2π	

→

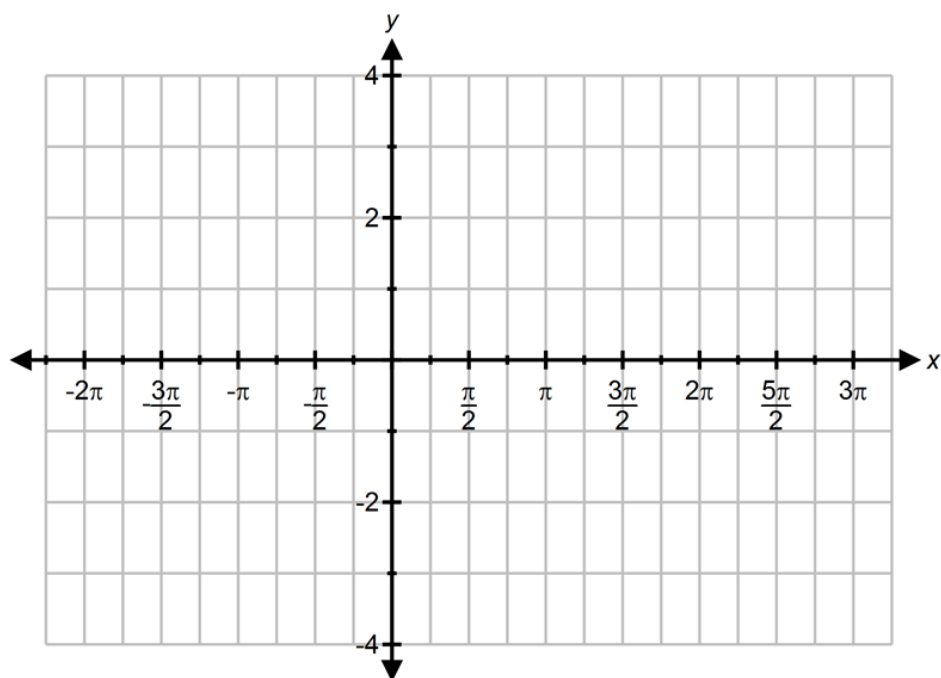
x	y



→

Lesson 5.1 Graphing sine and cosine function

Method 2: Use Inequality and Key Points $y = 3 \cos 2x$



P.233-236 #4-5 (no graph), 6-10, 14