Unit 5 Trigonometry Day 8 & 9

Graphs of
Sine and Cosine and Tangent

Amplitude, Midline, and Period
of Sine and Cosine Graphs

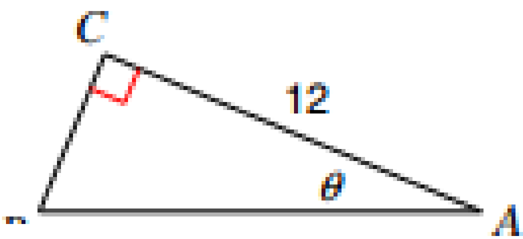
Unit 5 Trigonometry Day 8

Introduction to Graphs of Sine and Cosine

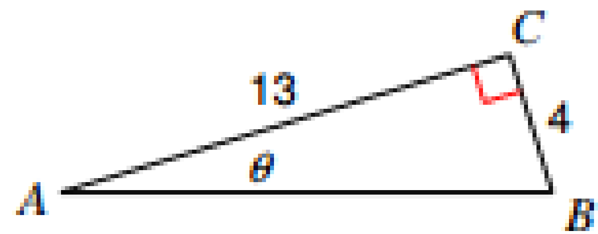
Warm-Up

Solve for the variable:

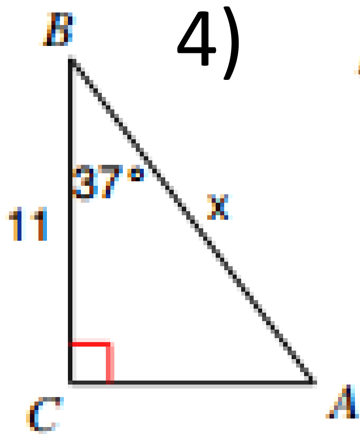
1)



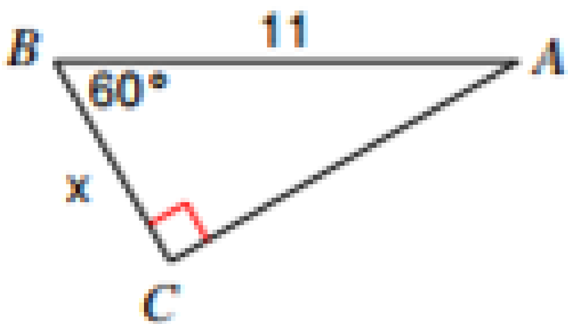
2)



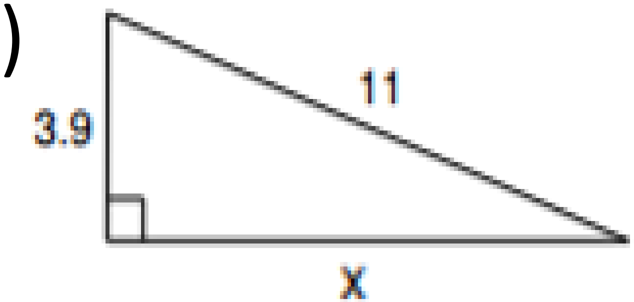
3)



4)



5)



Add to your notes:

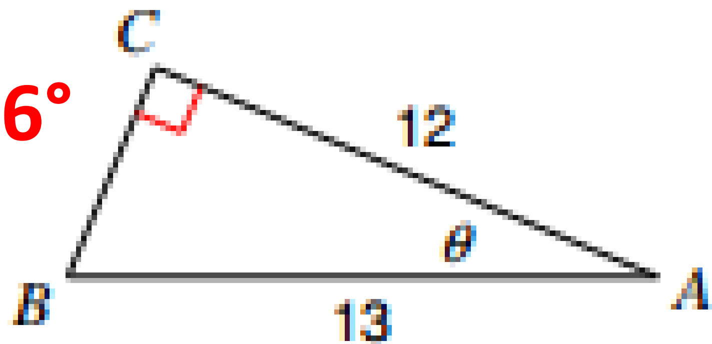
6) The angle of depression from an airplane to the landing strip is 32°. If the plane is at an altitude of 1000 ft, how far does the plane have to travel to get to the landing strip?

Warm-Up ANSWERS

Solve for the variable:

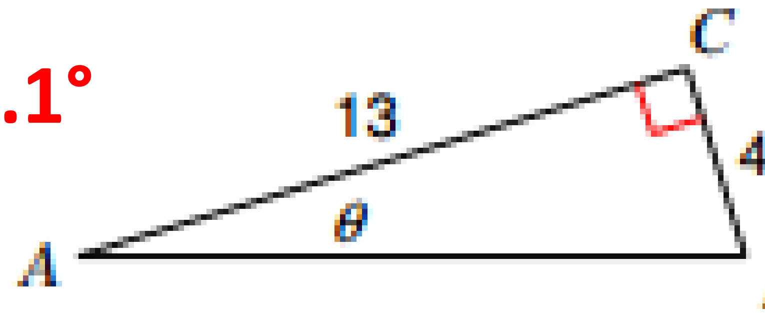
1)

22.6°

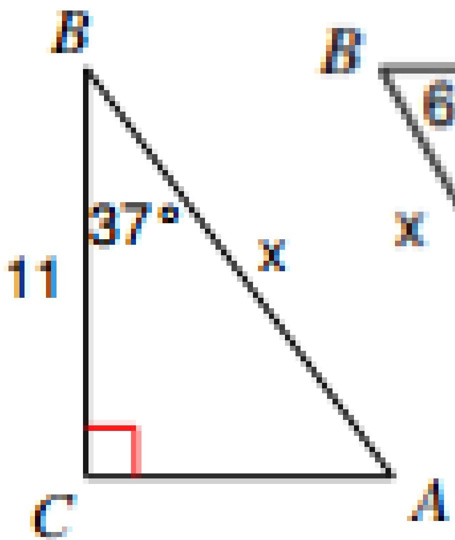


2)

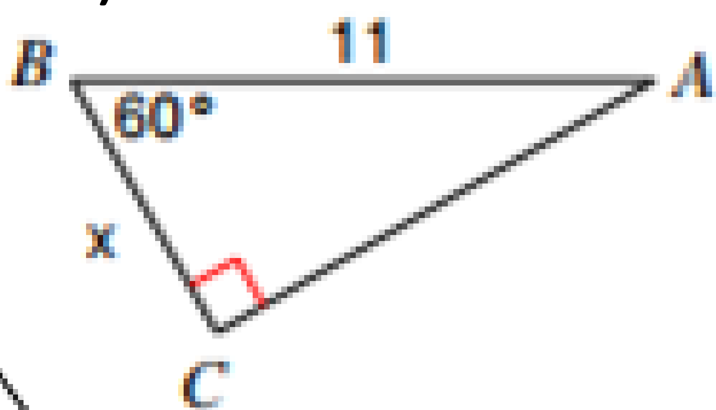
17.1°



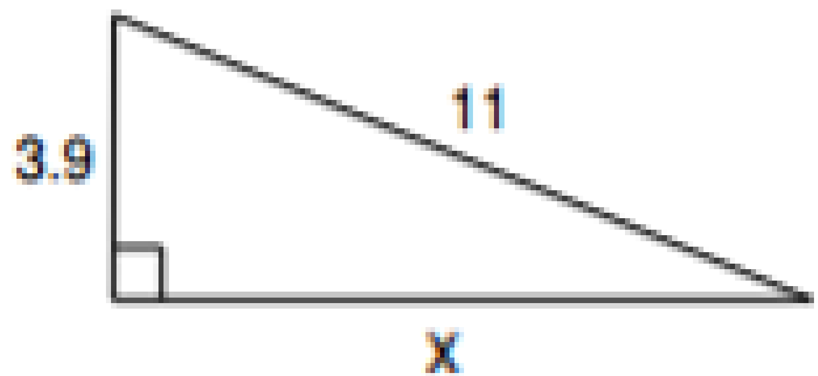
3) 13.8



4) 5.5



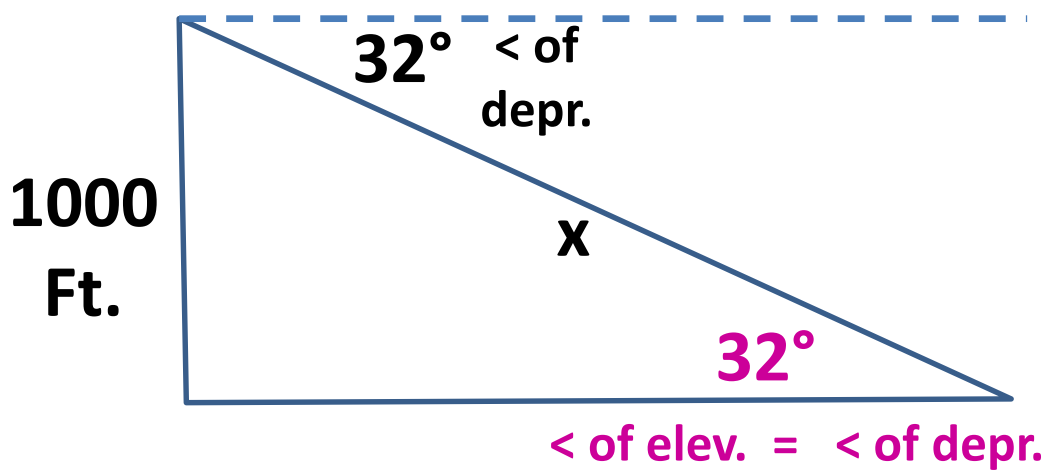
5) 10.3



Warm-Up ANSWERS

Add to your notes:

6) The angle of depression from an airplane to the landing strip is 32°. If the plane is at an altitude of 1000 ft, how far does the plane have to travel to get to the landing strip?



$$\sin(32^\circ) = \frac{1000}{x}$$

$$x \sin(32^\circ) = 1000$$

$$x = \frac{1000}{\sin(32^\circ)}$$

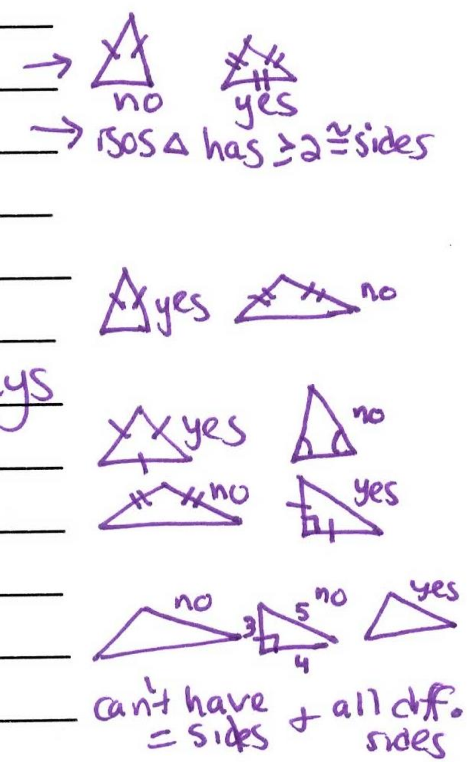
1887.08 ft

Homework Answers – Packet p. 15

Day 6 Homework: Classifying Triangles and their parts

Answer each question with *never*, *sometimes*, or *always*.

1. *Right* triangles can be obtuse triangles. never
2. *Isosceles* triangles are *equilateral* triangles. sometimes
3. *Equilateral* triangles are *isosceles* triangles. always
4. *Obtuse* triangles have *more than* one obtuse angle. never
5. *Equilateral* triangles have the same angle measure. always
6. *Isosceles* triangles are acute triangles. sometimes
7. I can use the term *equilateral* when referring to *equiangular* triangles. always
8. *Acute* triangles are *equiangular*. sometimes
9. *Isosceles* triangles are *right* triangles. sometimes
10. The angles in *scalene* triangles are different. always
11. A scalene triangle is an acute triangle. sometimes
12. An equilateral triangle is a scalene triangle. never

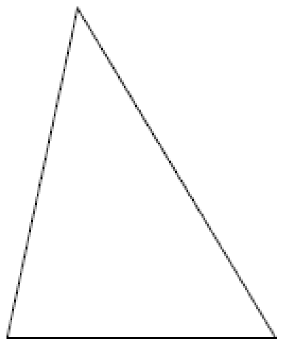


Homework Answers

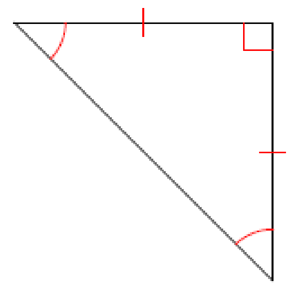
Remember to always give 2 names when classifying triangles!

Classify each triangle by its angles and sides. Equal sides and equal angles, if any, are indicated in each diagram.

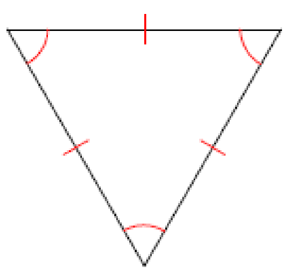
13) acute scalene



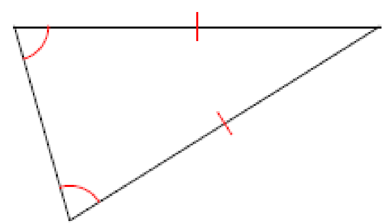
14) right isosceles



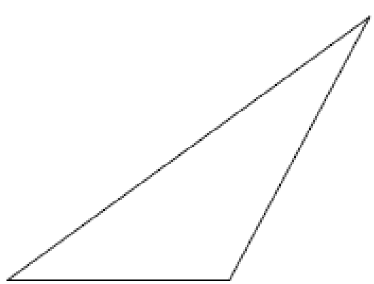
15) equilateral equiangular



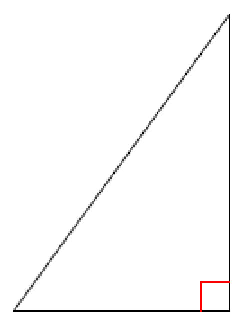
16) acute isosceles



17) obtuse scalene



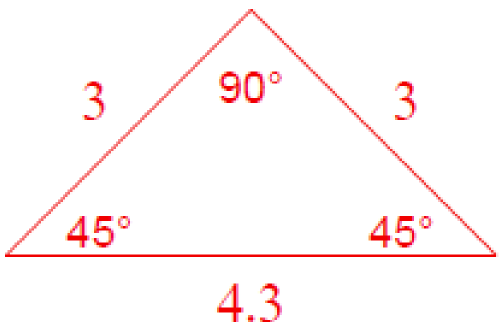
18) right scalene



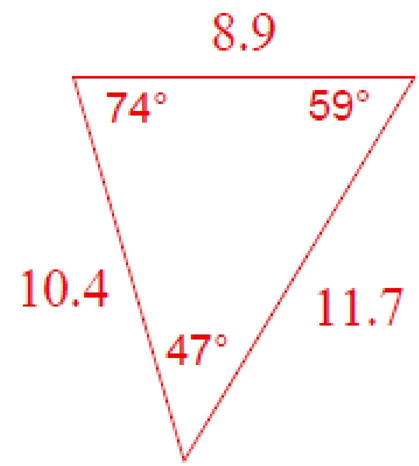
Homework Answers – Packet p. 16

Sketch an example of the type of triangle described. Label the sides and angles with realistic measurements. If no triangle can be drawn, write "not possible."

19) right isosceles

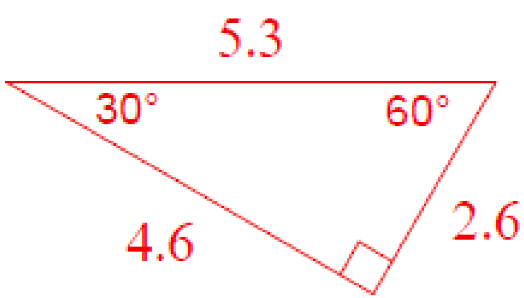


20) acute scalene

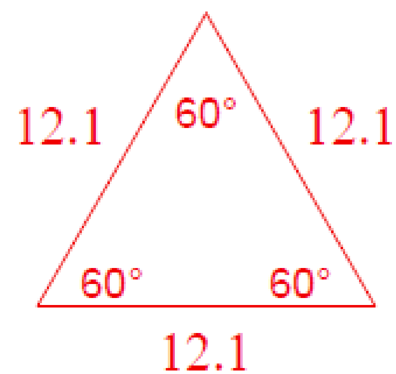


Answers will vary! ☺

21) right scalene



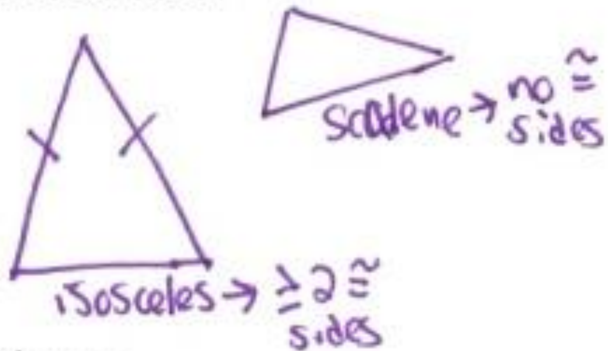
22) equilateral



Homework Answers

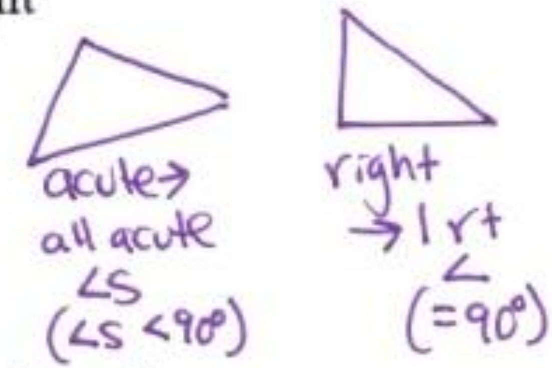
23) scalene isosceles

Not possible



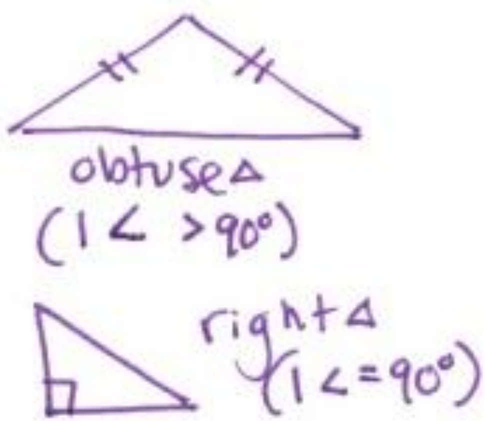
24) acute right

Not possible



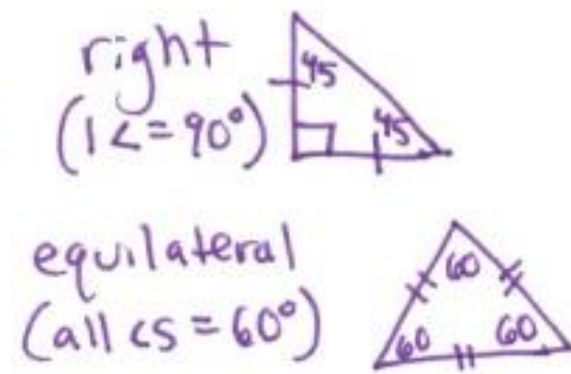
25) right obtuse

Not possible



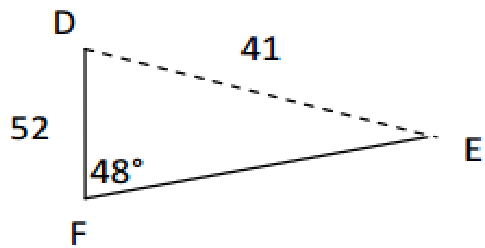
26) right equilateral

Not possible



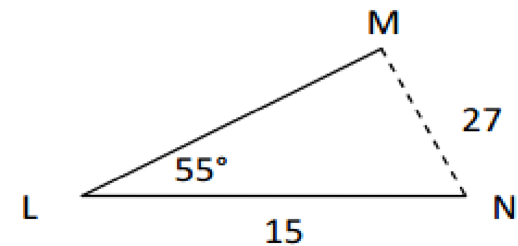
HW Answers: Finish Notes p. 14-15

1. For ΔDEF,
$e = 52, f = 41$, and $m\angle F = 48°$. Find all possible $m\angle E$ to the nearest degree.



$m\angle E = 70.5^o$ or 109.5^o

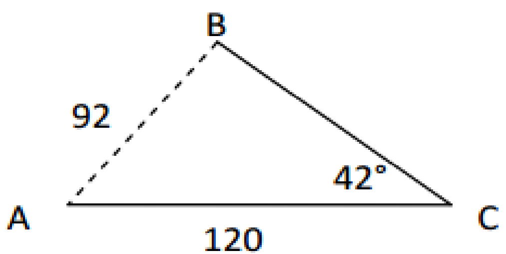
2. For ΔLMN,
$l = 27, m = 15$, and $m\angle L = 55°$. Find all possible $m\angle M$ to the nearest degree.



$m\angle M = 27.1^o$

3. For ΔABC,
$b = 120, c = 92$, and $m\angle C = 42°$. How many triangles can be formed?

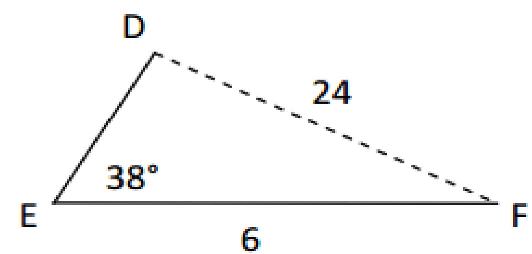
2 Δs



$m\angle B = 60.8^o$ or 119.2^o

4. For ΔDEF,
$d = 6, e = 24$, and $m\angle E = 38°$. How many Triangles can be formed?

1 Δ



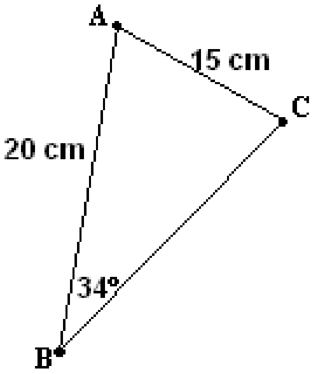
$m\angle D = 8.9^o$

HW Answers: Finish Notes p. 14-15

5. For triangle DEF, d = 25, e = 30, and m∠ E = 40°. Find all possible measurements of f to the nearest whole number.

f = 44.48

6. Given with , b = 15cm, and , solve the triangle.



Case 1:	Case 2:
C = 48.21°	C = 131.79°
A = 97.79°	A = 14.21.9°
a = 26.58	a = 6.58

7. Given triangle ABC, a = 8, b = 10, and m∠A = 34, solve the triangle.

Case 1:	Case 2:
B = 44.35°	B = 135.65°
C = 101.65°	C = 10.35°
c = 14.01	c = 2.57

Tonight’s Homework

Worksheet provided in class

Notes Day 8

Introduction to Sine and Cosine Graphs

You Need the printed Notes AND Notebook Paper

Graphing Sine & Cosine – basic properties & how they are derived from the Unit Circle

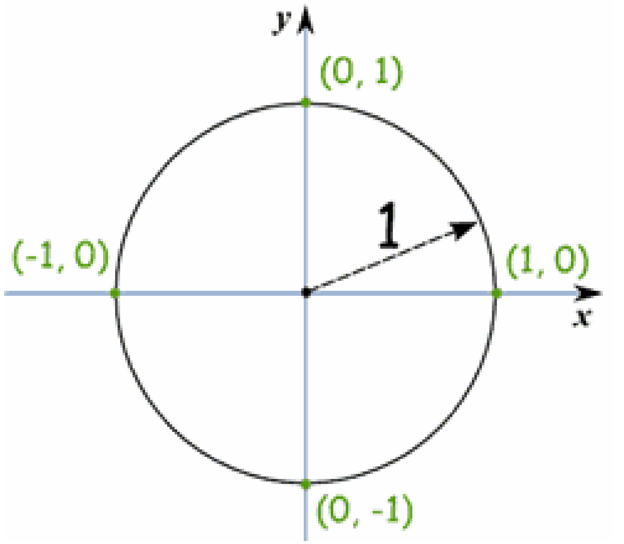
- Use a large Unit Circle to create Sine and Cosine Graphs

- Basic properties of Sine and Cosine Graphs Using the Unit Circle
  - > y in circle = sine values
  - > x in circle = cosine values
  - > angles in the circle are independent variables so they become our x-values on the sine and cosine graphs
  - > sine and cosine values are dependent upon the angle so they become our y-values on the sine and cosine graphs

- Reference the next few slides AND/OR Prentice Hall Algebra 2 Blue Textbook
  - > Sine is in Section 13-4 p.720-721
  - > Cosine is in Section 13-5 p.729-730

The Unit Circle

Not in Notes!
Just watch! ☺



The "Unit Circle" is a circle with a radius of 1.

Being so simple, it is a great way to learn and talk about lengths and angles.

The center is put on a graph where the x axis and y axis cross, so we get this neat arrangement here.

Sine, Cosine and Tangent

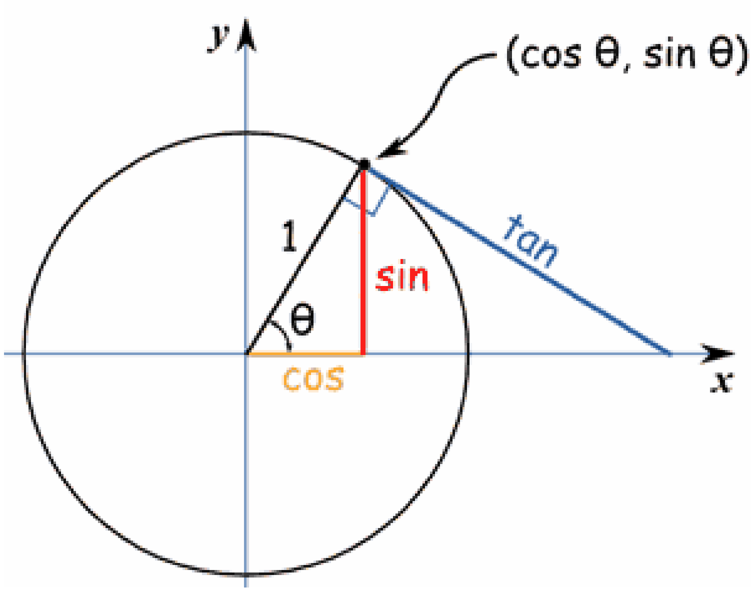
Because the radius is 1, you can directly measure sine, cosine and tangent.

What happens when the angle, θ, is 0°?

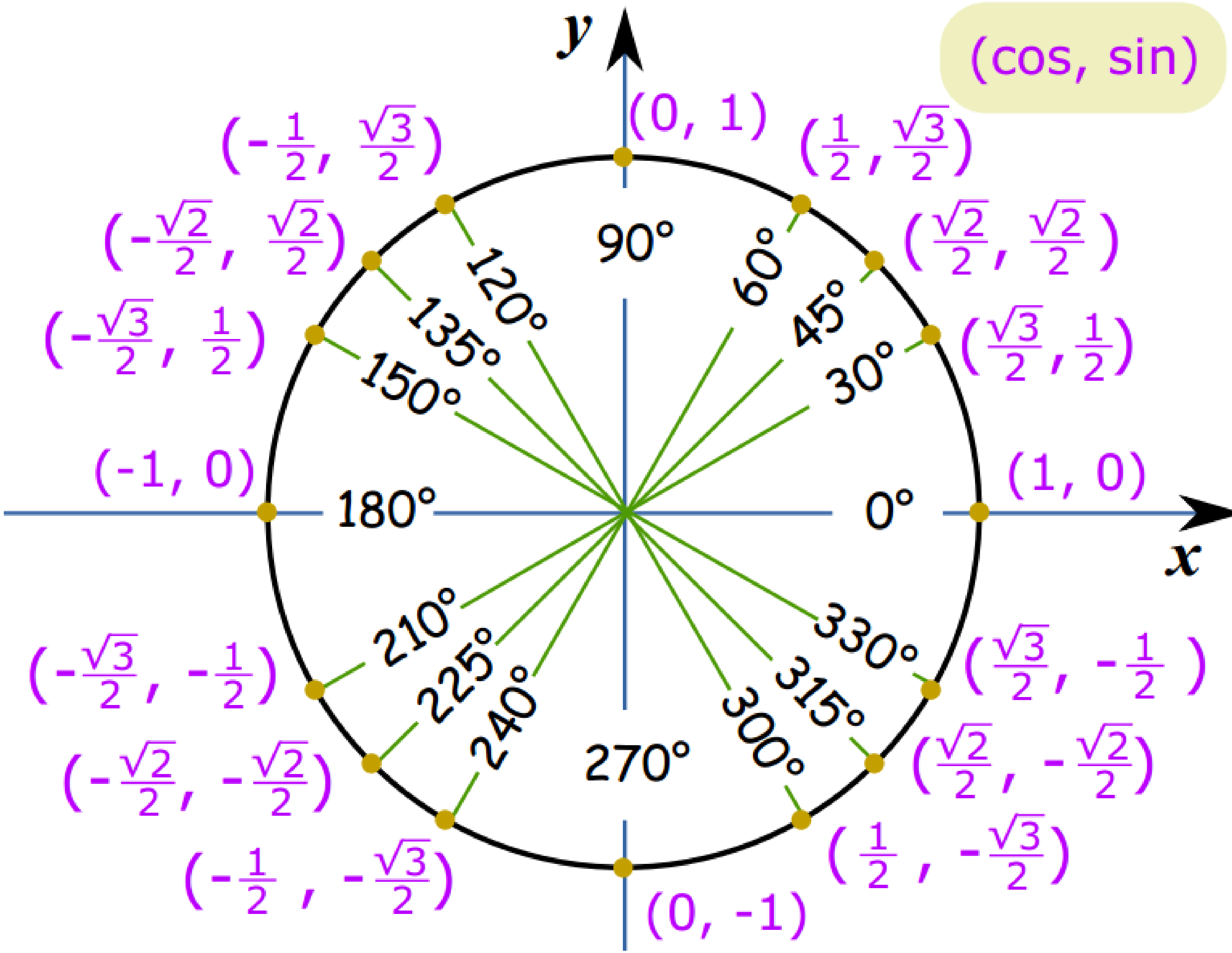
- cos 0° = 1, sin 0° = 0 and tan 0° = 0

What happens when θ is 90°?

- cos 90° = 0, sin 90° = 1 and tan 90° is undefined



Not in Notes! Watch this interactive unit circle ☺



Day 8 (Monday’s) Homework

Worksheet provided in class

(back of new unit outline)

Unit 5 Trigonometry Day 9

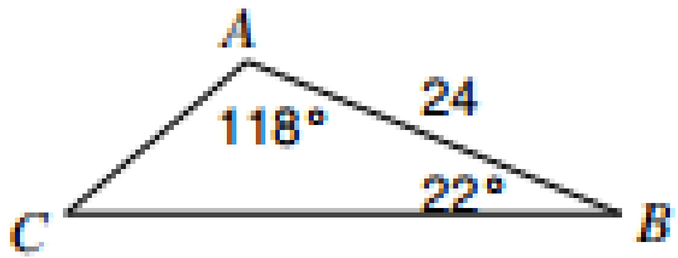
Graphs of
Sine and Cosine and Tangent

Amplitude, Midline, and Period
of Sine and Cosine Graphs

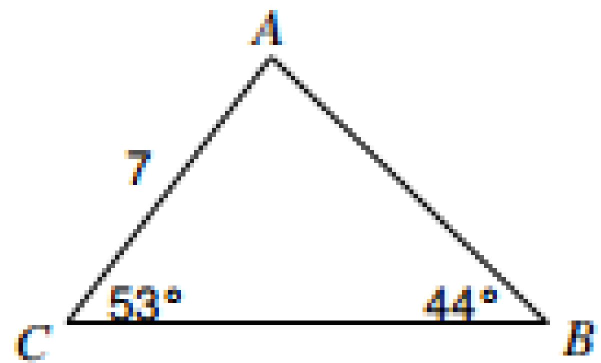
Day 9 Warm-Up

Find each measurement indicated. Round your answers to the nearest tenth.

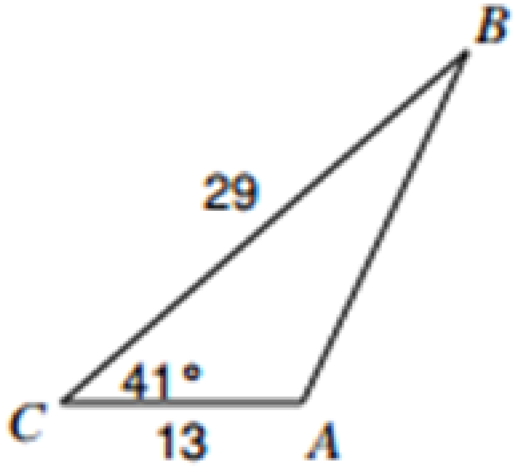
1) Find AC



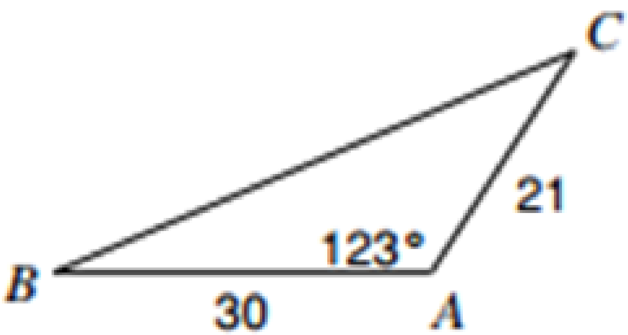
2) Find AB



3) Find AB



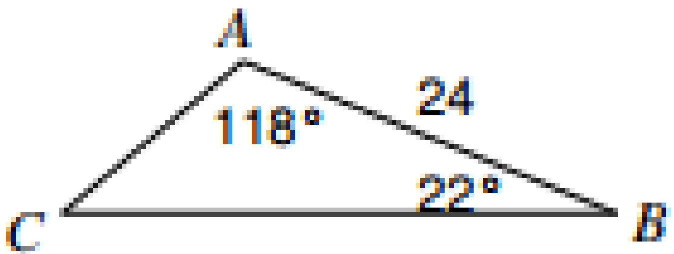
4) Find BC



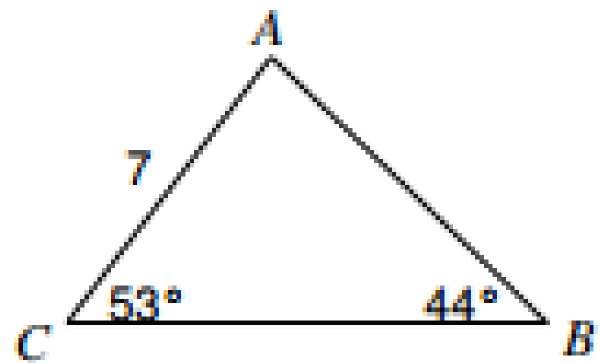
Day 9 Warm-Up ANSWERS

Find each measurement indicated. Round your answers to the nearest tenth.

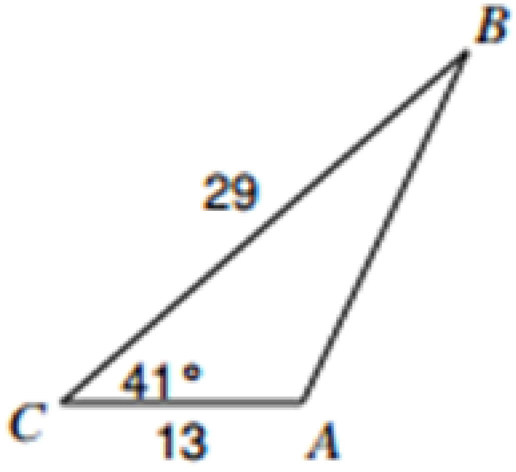
1) Find AC **14**



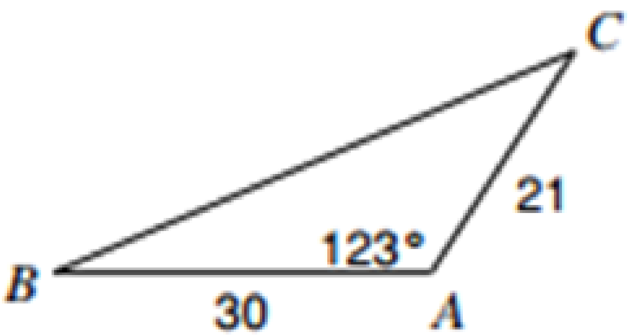
2) Find AB **8**



3) Find AB **21**



4) Find BC **45**



Notes Day 8 & 9

Let’s see how to use the calculator to get these graphs!

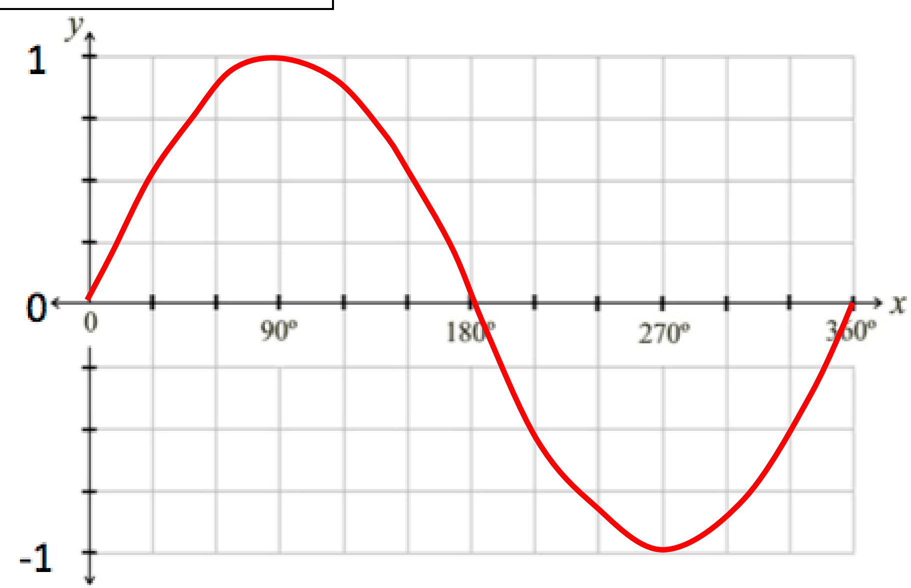
Notes p. 20-22

Complete the table below: **Make sure your calculator is in degree mode!!**

Degree	sin(x)	Point (Degree, sin(x))
0	0	(0,0)
30	0.5	(30, 0.5)
60	0.866	(60, 0.866)
90	1	(90, 1)
120	0.866	(120, 0.866)
150	0.5	(150, 0.5)
180	0	(180,0)
210	-0.5	(210, -0.5)
240	-0.866	(240, -0.866)
270	-1	(270, -1)
300	-0.866	(300, -0.866)
330	-0.5	(330, -0.5)
360	0	(360, 0)

Graph Sin(x)

Notes p. 20

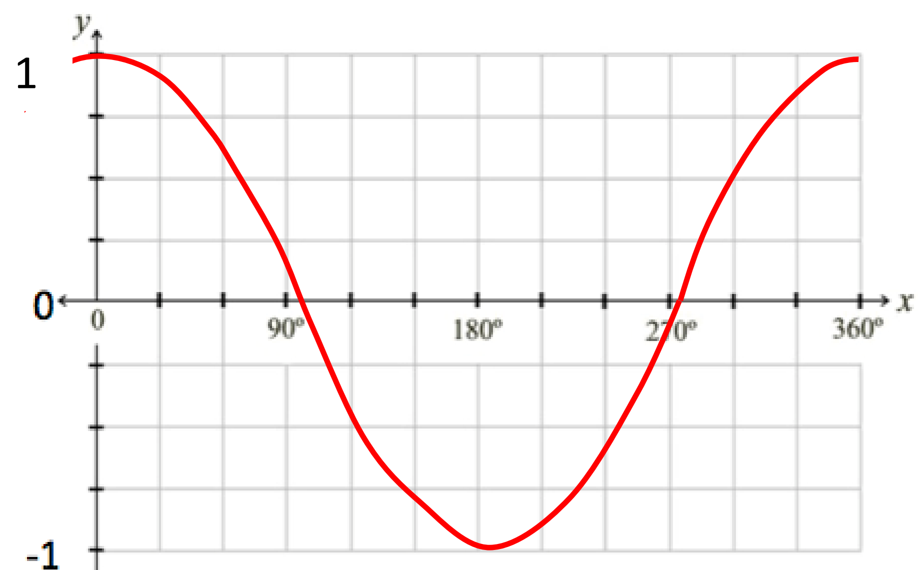


Complete the table below:

Degree	Cos(x)	Point (Degree, Cos(x))
0	1	(0,1)
30	0.866	(30, 0.866)
60	0.5	(60, 0.5)
90	0	(90,0)
120	-0.5	(120, -0.5)
150	-0.866	(150, -0.866)
180	-1	(180, -1)
210	-0.866	(210, -0.866)
240	-0.5	(240, -0.5)
270	0	(270, 0)
300	0.5	(300, 0.5)
330	0.866	(330, 0.866)
360	1	(360, 1)

Graph Cos(x)

Notes p. 21



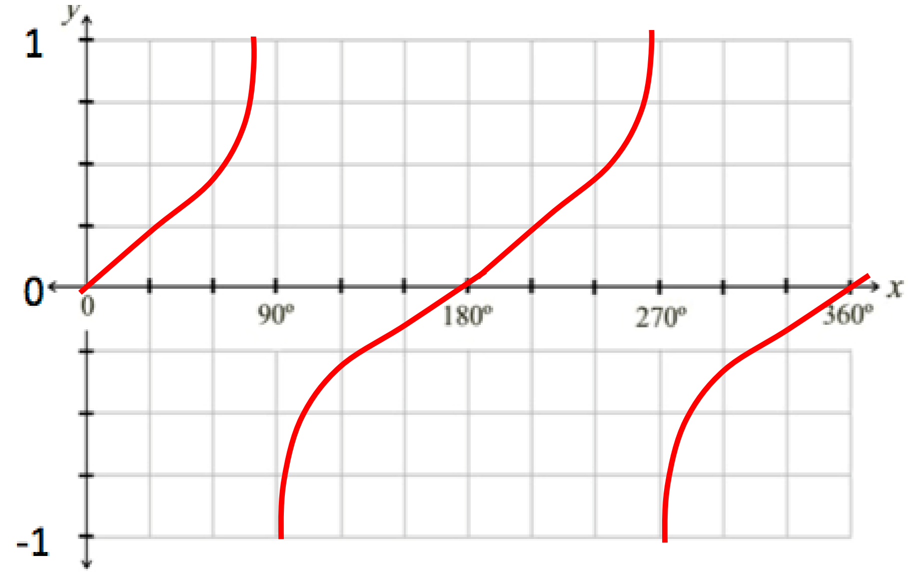
Graph Tan(x)

Notes p. 22

Complete the table below:

Degree	Tan(x)	Point (Degree, Tan(x))
0	0	(0,0)
30	0.577	(30, 0.577)
60	1.73	(60, 1.73)
90	Undefined	
120	-1.73	(120, -1.73
150	-0.577	(150, -0.577)
180	0	(180, 0)
210	0.577	(210, 0.577)
240	1.73	(240, 1.73)
270	Undefined	
300	-1.73	(300, -1.73)
330	-0.577	(330, -0.577)
360	0	(360, 0)

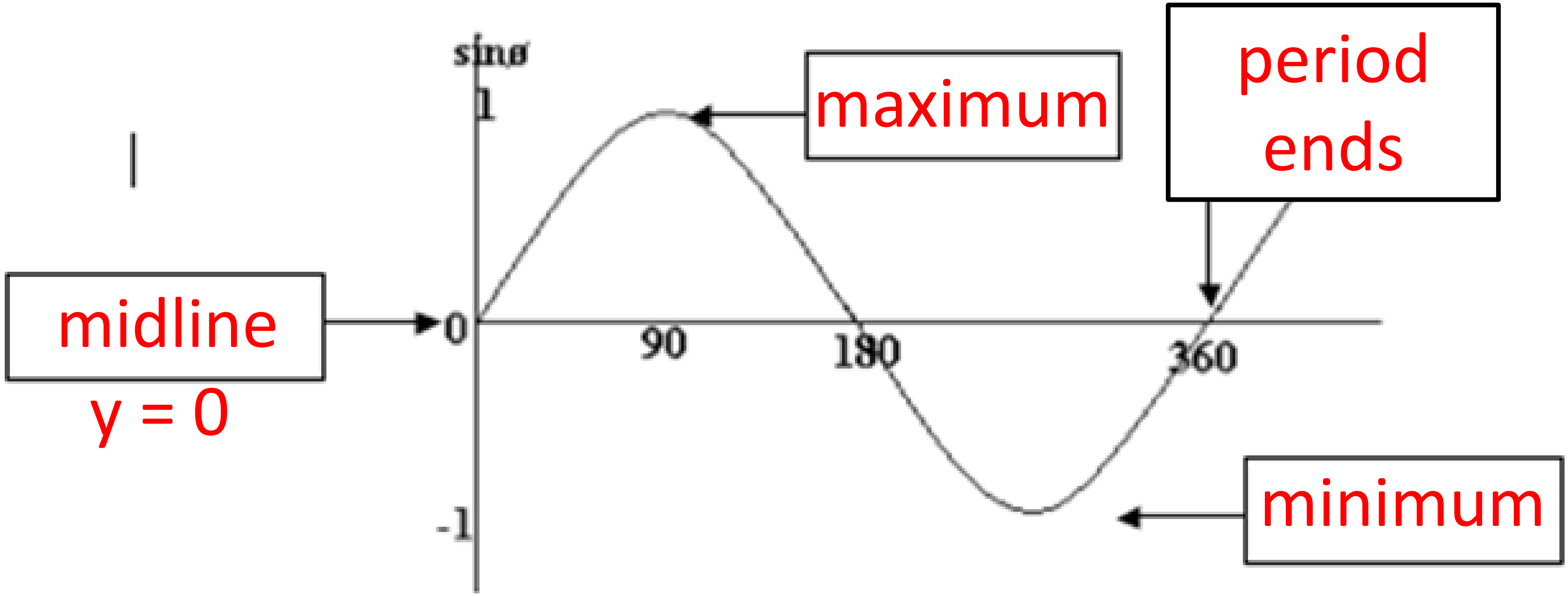
What happens to tangent at 90° and 270°? Why is this happening?



Notes p. 23-24
Graphs of Trig Functions

By each graph in your notes,
fill in some of the key features
as we discuss them on the next slides

I. Sine Graph



a. Sine is increasing:

(0, 90) U (270, 360)

b. Sine is decreasing:

(90, 270)

c. Sine is positive:

(0, 180)

d. Sine is negative:

(180, 360)

Plot of Sine

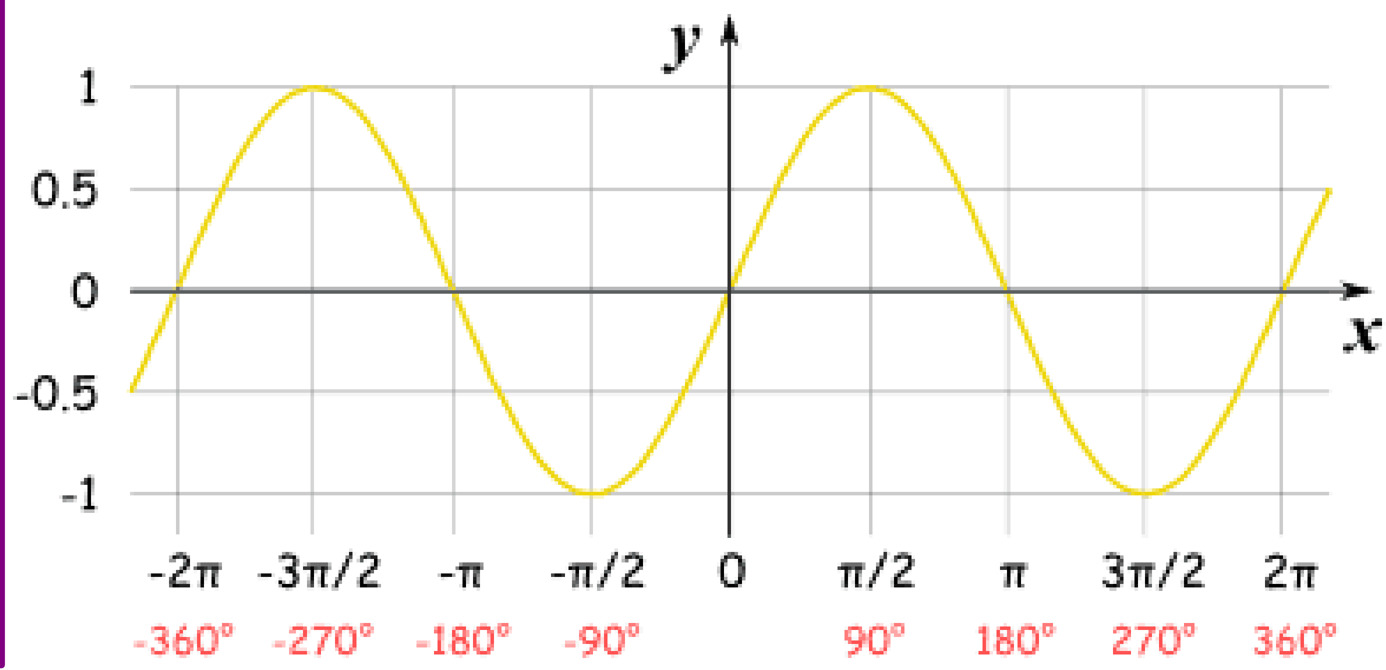
This exact graph is not in your Notes. Write these comments beside the graph in your notes!

The Sine Function has this beautiful up-down curve (which repeats every 2π radians, or 360°).

It starts at **0**, heads up to **1** by $\pi/2$ radians (90°) and then heads down to **−1**.

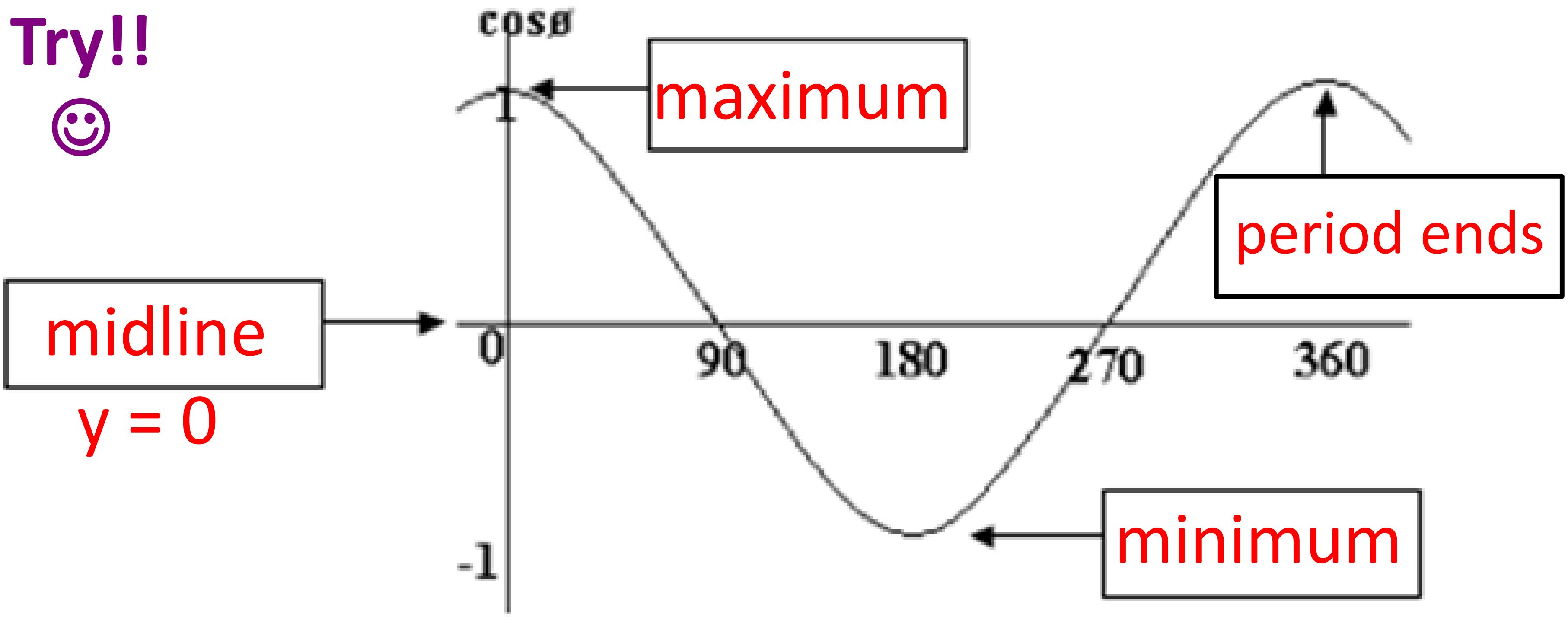
Sine has a hill and a valley!

This graph has one cycle in the negative direction and one cycle in the positive direction.



You Try!! ☺

II. Cosine Graph



a. Cosine is increasing:

(180, 360)

b. Cosine is decreasing:

(0, 180)

c. Cosine is positive:

(0, 90) U (270, 360)

d. Cosine is negative:

(90, 270)

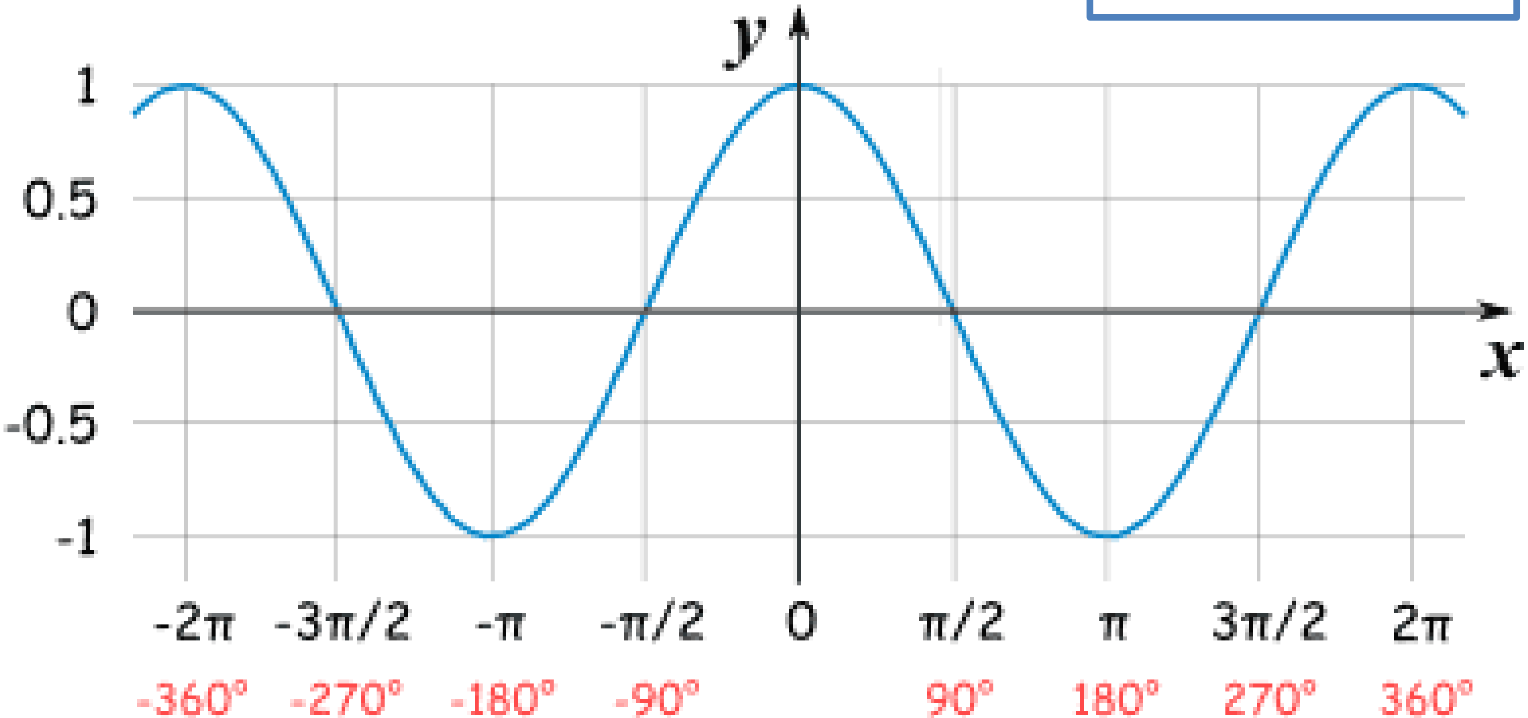
This exact graph is not in your Notes. Write these comments beside the graph in your notes!

Plot of Cosine

Cosine is just like Sine, but it starts at 1 and heads down until π radians (180°) and then heads up again.

Cosine has one big valley!

This graph has one cycle in the negative direction and one cycle in the positive direction.

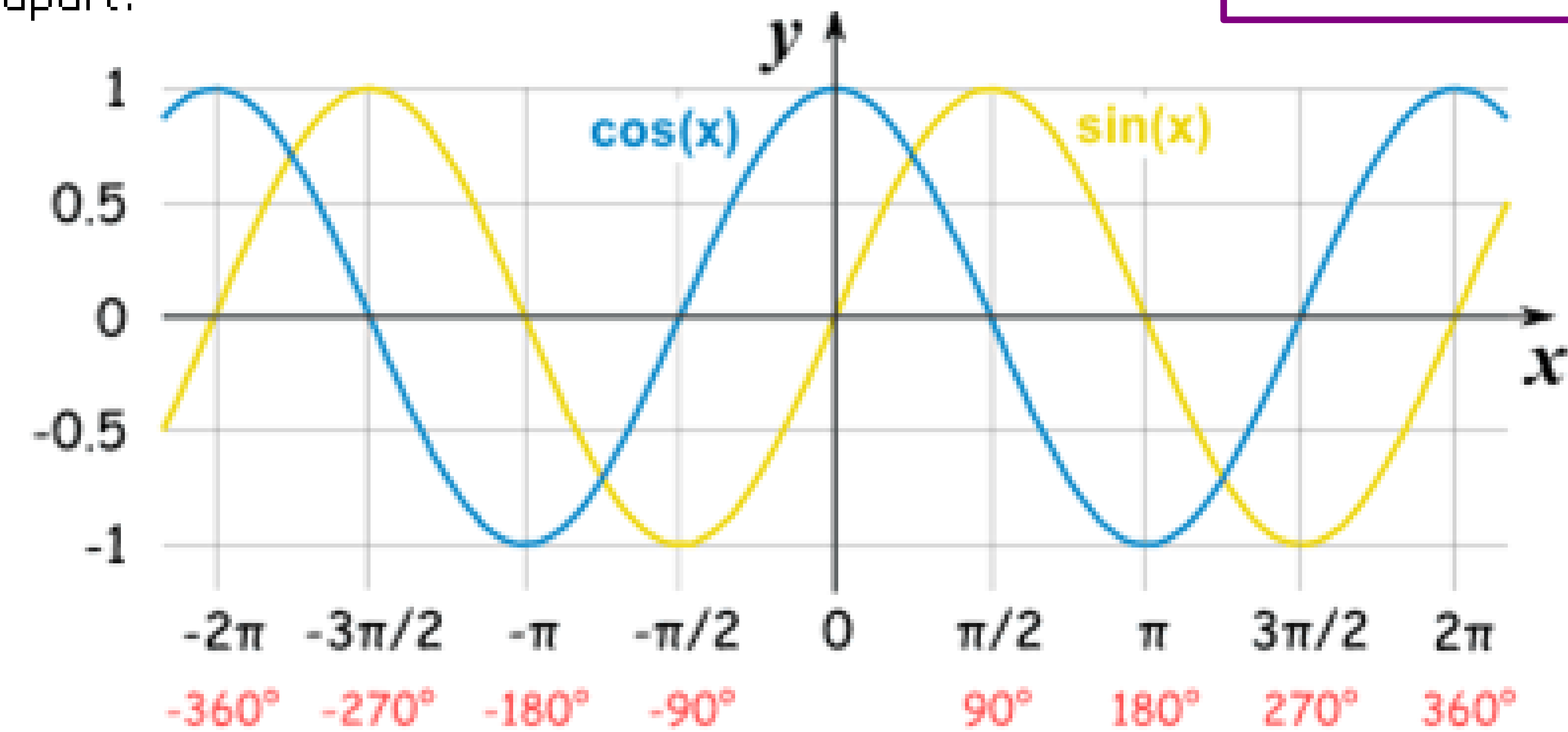


Graphs of Sine, Cosine and Tangent

Plot of Sine and Cosine

How are Sine and Cosine graphs related?

In fact Sine and Cosine are like **good friends**: they follow each other, exactly "**π**/2" radians, or 90°, apart.

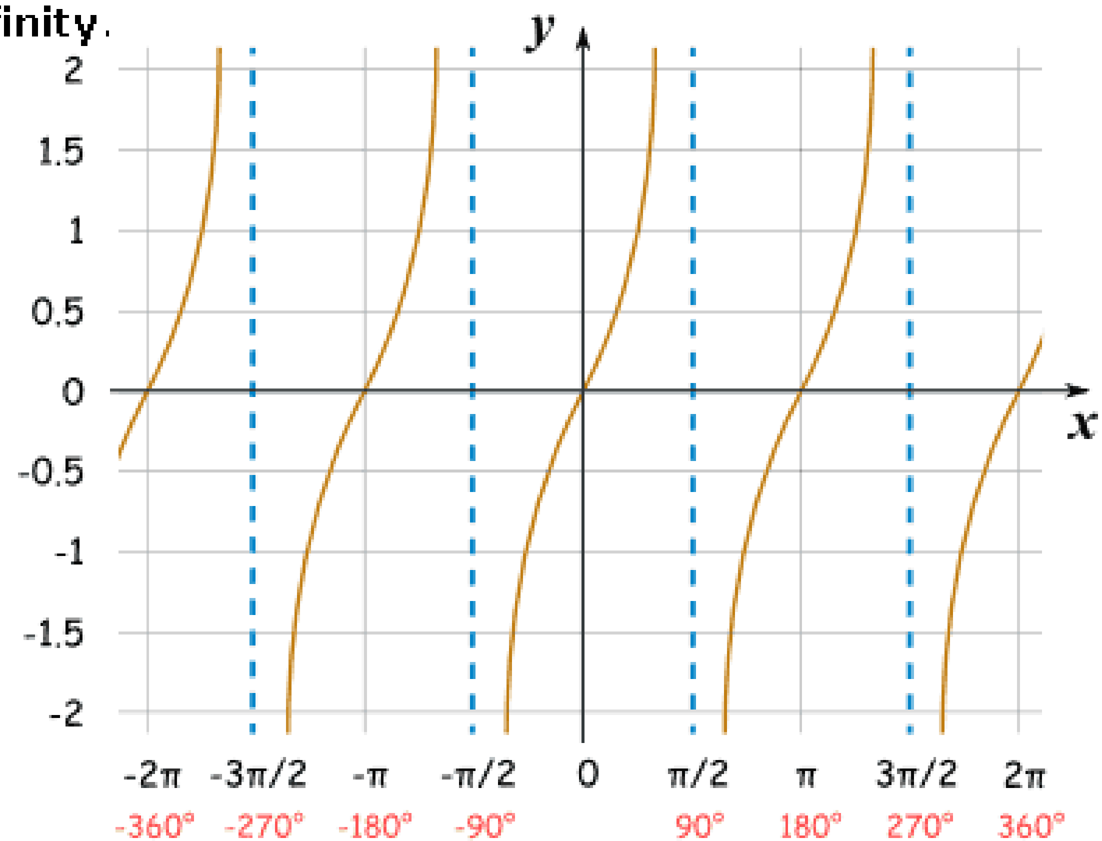


Sine and Cosine are Translations of each other by 90 degrees!

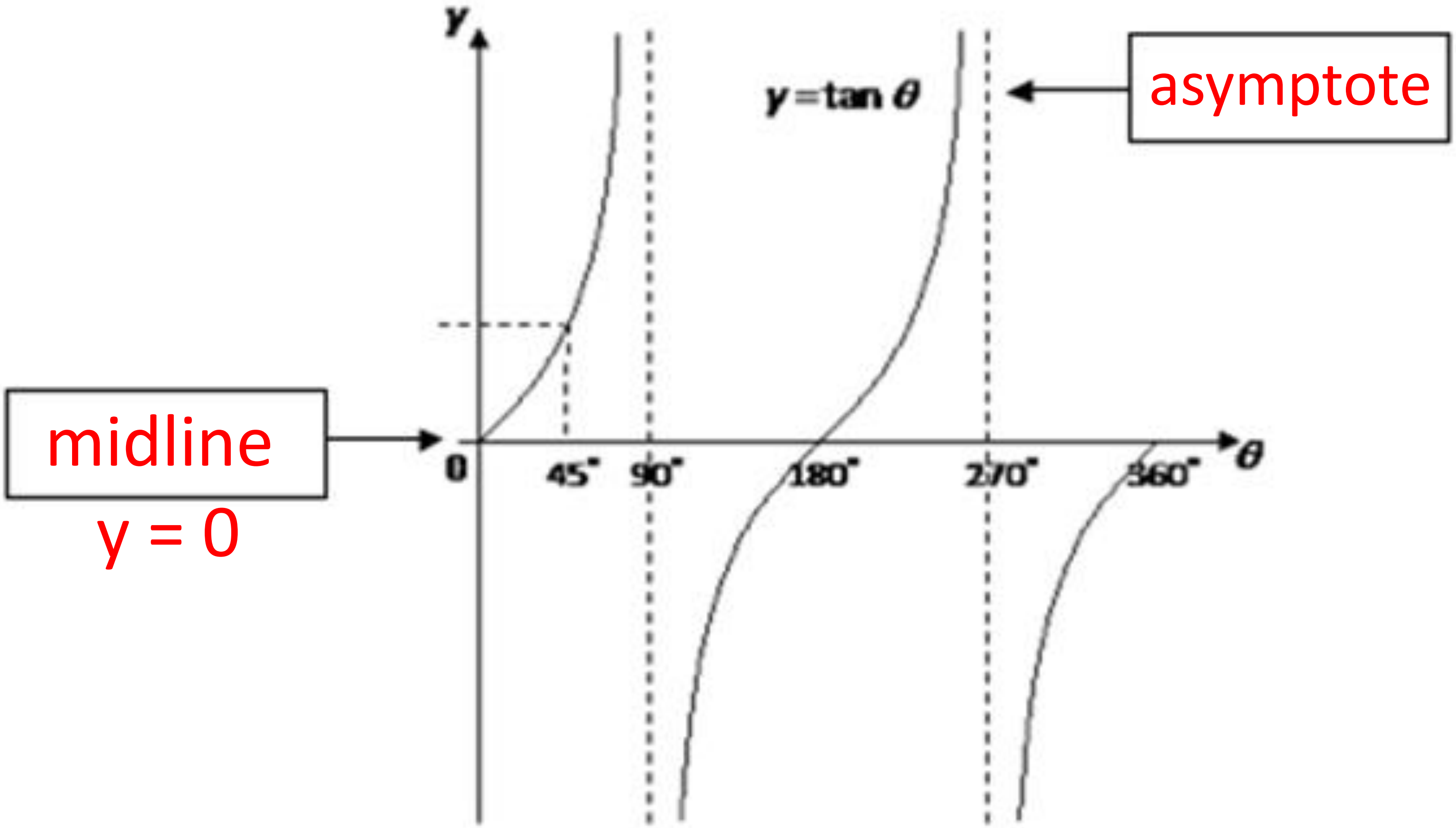
Plot of the Tangent Function

The Tangent function has a completely different shape ... it goes between negative and positive Infinity, crossing through 0 (every **π** radians, or 180°), as shown on this plot.

At **π**/2 radians, or 90° (and -**π**/2, 3**π**/2, etc) the function is officially **undefined**, because it could be **positive Infinity** or **negative Infinity**.



III. Tangent Graph



a. Tangent is increasing:

(0, 90) U (90, 270) U (270, 360)

b. Tangent is decreasing:

never

c. Tangent is positive:

(0, 90)U(180, 270)

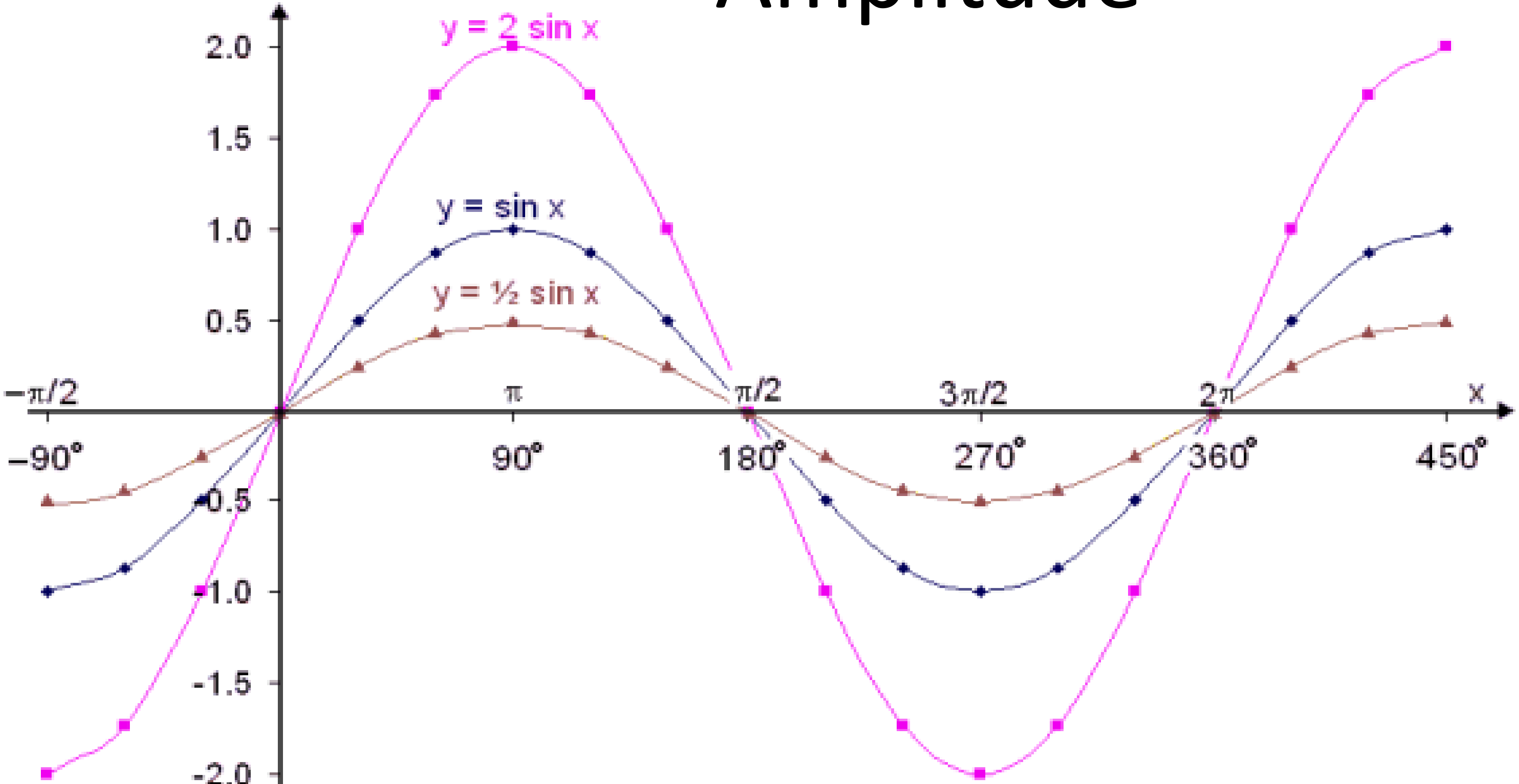
d. Tangent is negative:

(90, 180) U (270, 360)

Day 9 Notes continued
Amplitudes, Midlines, and Period

Notes p. 24-27

Amplitude



Given the standard equation y=asin(bx), how does "a" affect the graph?

The "a" affects the height of the graph.

What are the similarities and differences between the 3 graphs??

Summary:

Amplitude:

a. Amplitude is the height of the graph from the midline

b. A graph in the form of:

$y = a\sin[b(x-c)]+d$ and $y = a\cos[b(x-c)]+d$

has an amplitude of $|a|$.

c. The amplitude of a standard **sine** or **cosine** graph is **1**.

d. The amplitude of a sine or cosine graph can be found using the following formula:

$$\text{amplitude} = |a| = \left|\frac{\max - \min}{2}\right|$$

e. Find the amplitude for each of the following:

1. y = 3sinx $amp = |3| = 3$

2. y = -4cos5x $amp = |-4| = 4$

3. y = (1/3)sinx + 5 $amp = \left|\frac{1}{3}\right| = \frac{1}{3}$

Summary continued

Midline:

The midline is the line that "cuts the graph in half."

The midline is halfway between the max and the min.

The midline can be found by using the following formula:

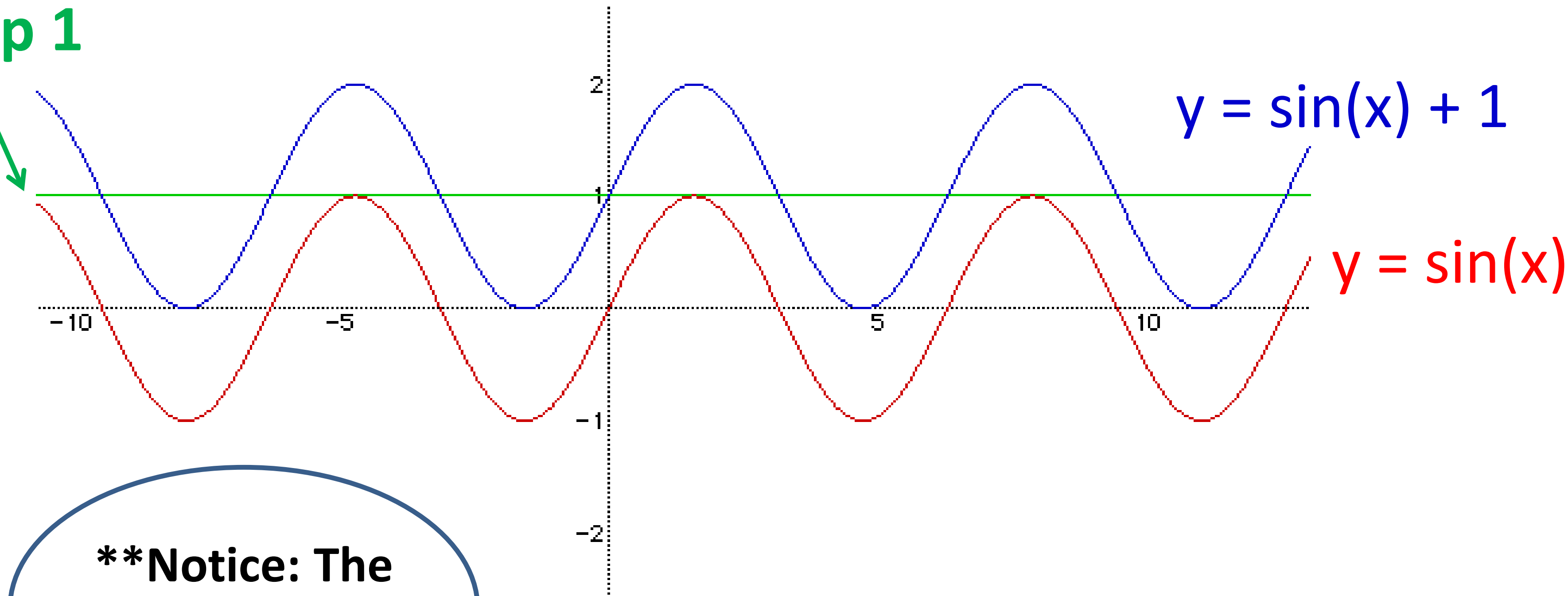
Midline is $y = \frac{(Max + Min)}{2}$ OR $y = Min + Amp$

When there is no vertical shift, the midline is always the x-axis (y = 0).

(Ex: y = sin(x), y = 2sin(x), y = sin(3x) all have a midline of y = 0)

Midline Continued

Midline moved up 1



****Notice: The amplitude did not change.**

Period of a Function

Period is the length of 1 cycle.

$$f(x) = A\sin(Bx)$$

Y = **sin**(x) has a period of **360**.

y = **cos**(x) has a period of **360**.

y = **tan**(x) has a period of **180**.

$$Per = \frac{2\pi}{|B|} = \frac{360^\circ}{|B|}$$

Note: this version of the formula is in radians, which is not a focus in math 2

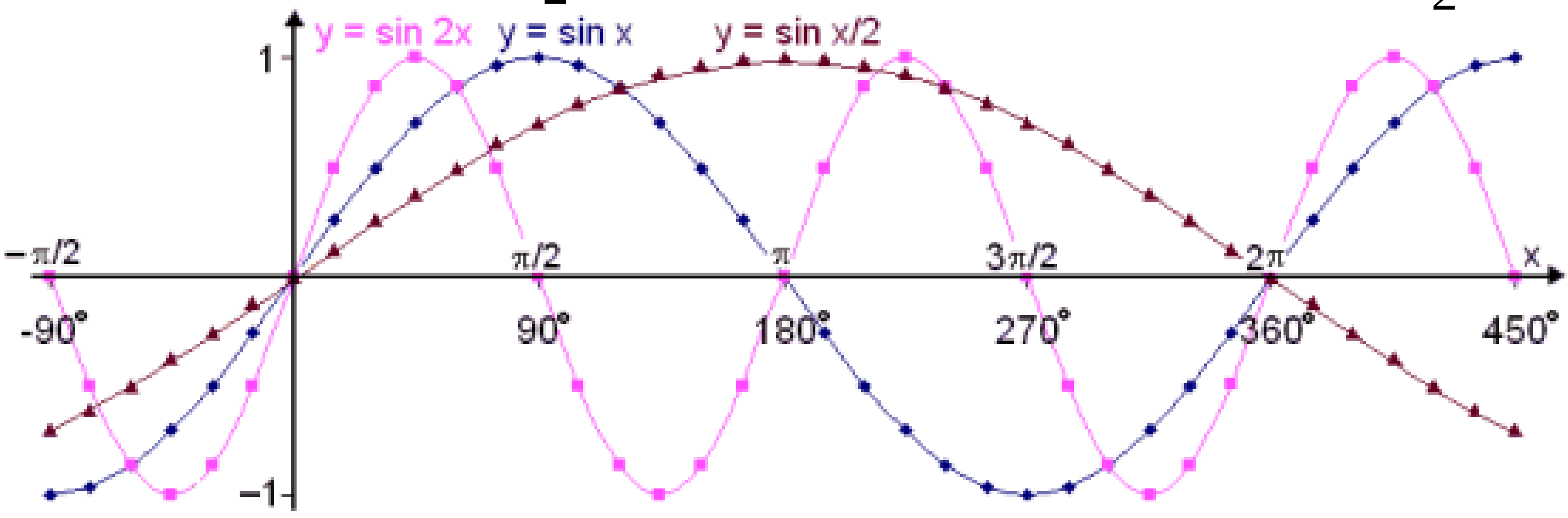
$$f(x) = A\sin(Bx) \qquad Per = \frac{2(180)}{|B|} = \frac{360^\circ}{|B|}$$

Think of the pi as 180 degrees!!!

$$y = \sin x;\ period = \frac{360^\circ}{1} = 360^\circ \qquad y = \cos x;\ period = \frac{360^\circ}{1} = 360^\circ$$

$$y = \sin(\frac{1}{2}x);\ per = \frac{360^\circ}{(1/2)} = 720^\circ \qquad y = \cos(\frac{1}{2}x);\ per = \frac{360^\circ}{(1/2)} = 720^\circ$$

$$y = \sin(2x);\ per = \frac{360^\circ}{2} = 180^\circ \qquad y = \cos(2x);\ per = \frac{360^\circ}{2} = 180^\circ$$



Let's Graph one together! Notes pg. 26

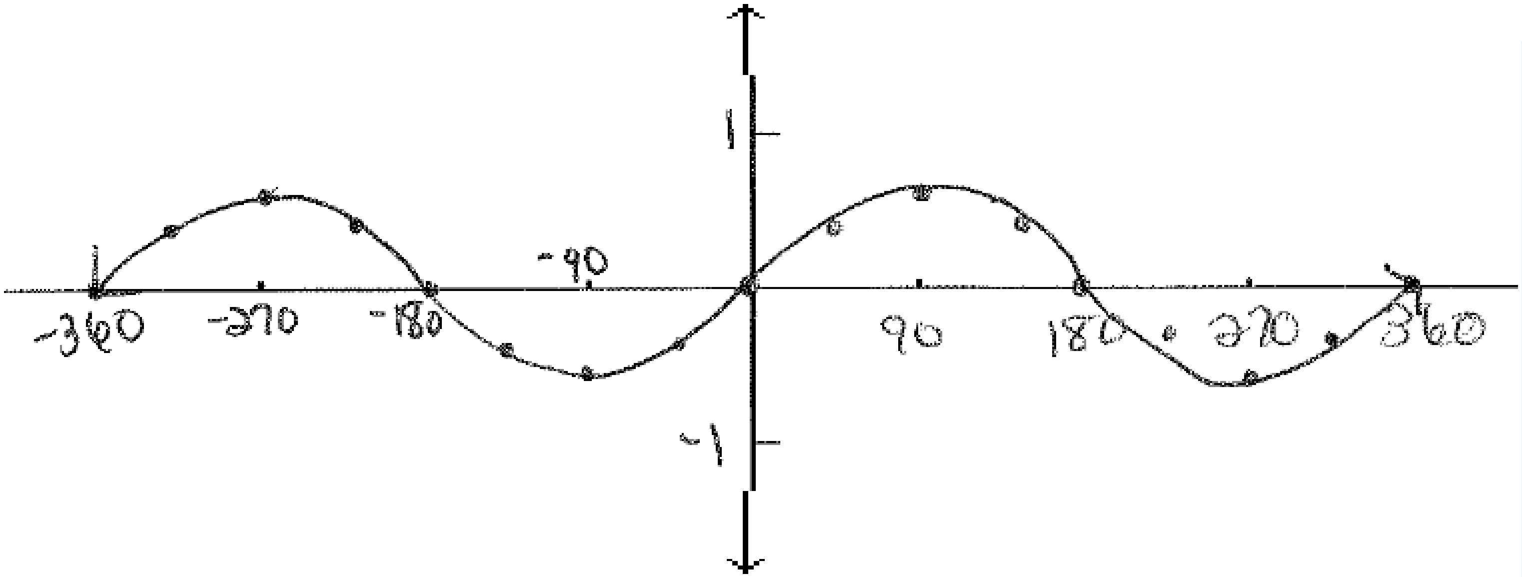
We'll graph one period in the positive direction and one period in the negative direction.

****TIP: divide each period into 8 even sections AND use the ASK feature in the calculator!***

(2^{nd} Window Indep -> ASK)

4. $y = 0.5 \sin(x)$

Amplitude: 0.5 Midline: y = 0 **Period:** 360º



Always find the period before graphing!

Label both axes!

Practice – you try the others!

Notes pg. 26-27 #5, 6, 7

For each problem:

*graph **one period** in the positive direction and
*one period** in the negative direction.

Remember to label the axes!

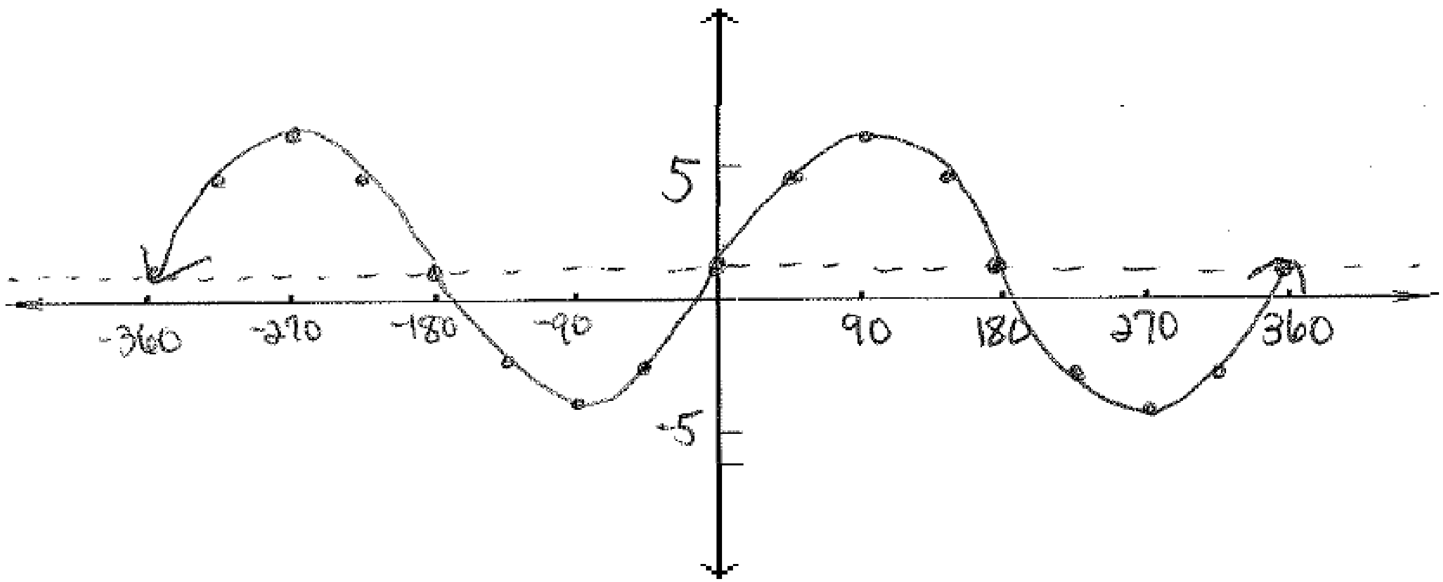
HINT: divide each period into 8 even sections AND use the ASK feature in the calculator!

Practice Answers

Graph one period in the positive direction and one period in the negative direction.

5. $y = 5 \sin(x) + 1$

Amplitude: 5 Midline: $y = 1$ **Period:** 360^{o}



Always find the period before graphing!

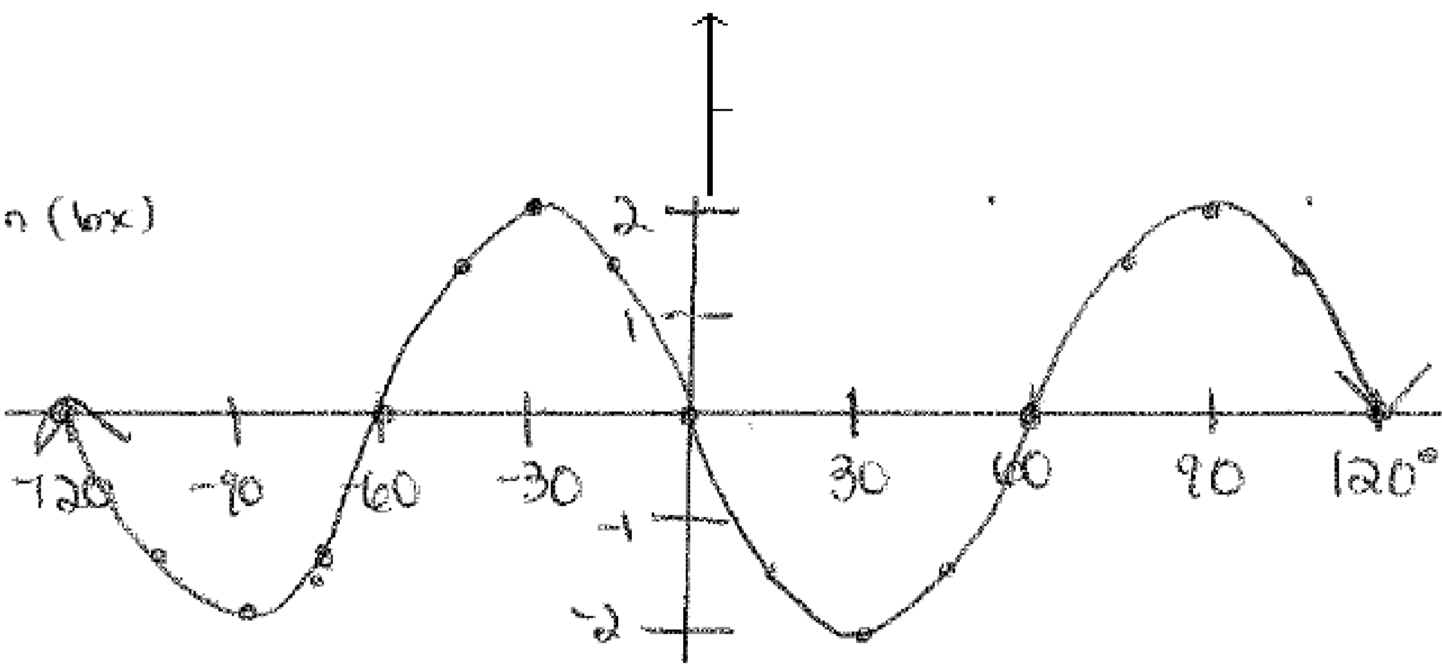
Label both axes!

Practice Answers

Graph one period in the positive direction and one period in the negative direction.

6. $y = -2 \sin(3x)$

Amplitude: <u>2</u> Midline: <u>y = 0</u> **Period:** <u>120^{o}</u>



Always find the period before graphing!

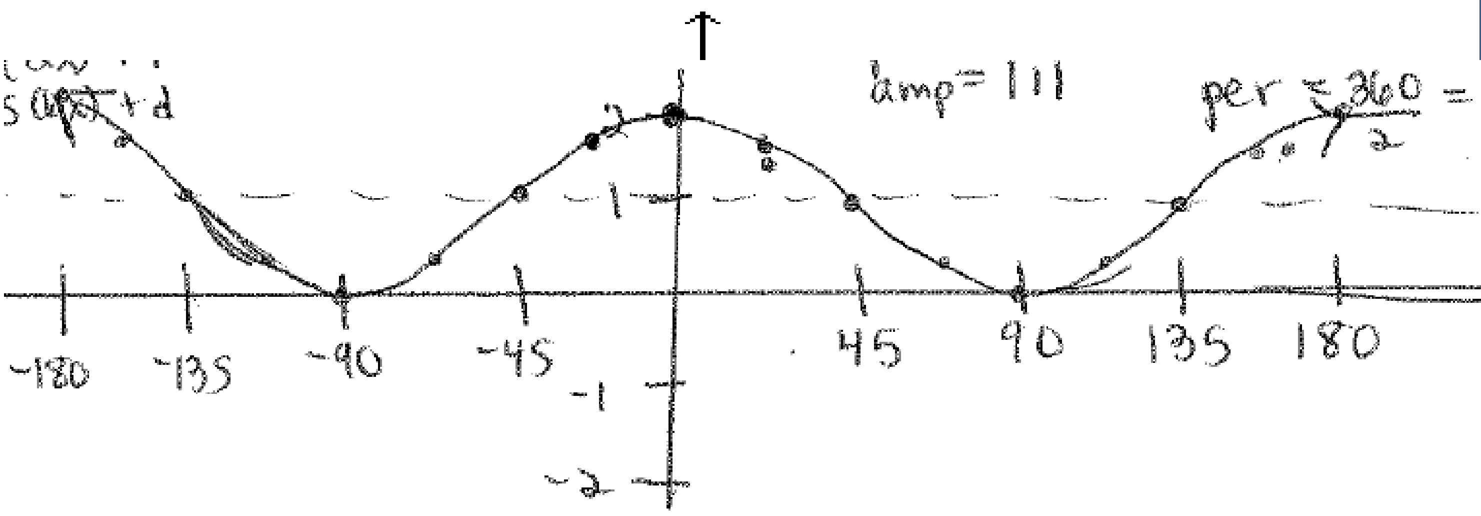
Label both axes!

Practice Answers

We'll graph one period in the positive direction and one period in the negative direction.

7. $y = \cos(2x) + 1$

Amplitude: 1 Midline: y = 1 **Period: 180^{o}**



Always find the period before graphing!

Label both axes!