

# Unit 5 Day 11

Solving Trig Functions



# Warm-up Day 11

1. A water skier must be at least a horizontal distance of 50 feet from the boat in order to safely avoid undertow from the propeller. If the angle of elevation is  $35^\circ$  from the skier to the pole how long is the rope? (round to nearest hundredth)

$$x = 61.04 \text{ ft (cos)}$$

2. A 21-foot tree needs trimming. Safety guidelines say the angle made by the ladder and the ground should be  $70^\circ$ . How long should the ladder be to reach the top of the tree?

$$x = 22.35 \text{ ft (sin)}$$

3. An isosceles triangle has a 34 degree vertex angle and a base 17 cm long. What is the perimeter of the triangle?

$$75.15 \text{ cm}$$

4. A person sitting on the balcony of her hotel room in Manhattan spots a skyscraper that is 420 feet away. From the balcony, the angle of elevation for the top of the skyscraper is  $23^\circ$  and the angle of depression to its base is  $48^\circ$ . How tall is the skyscraper?

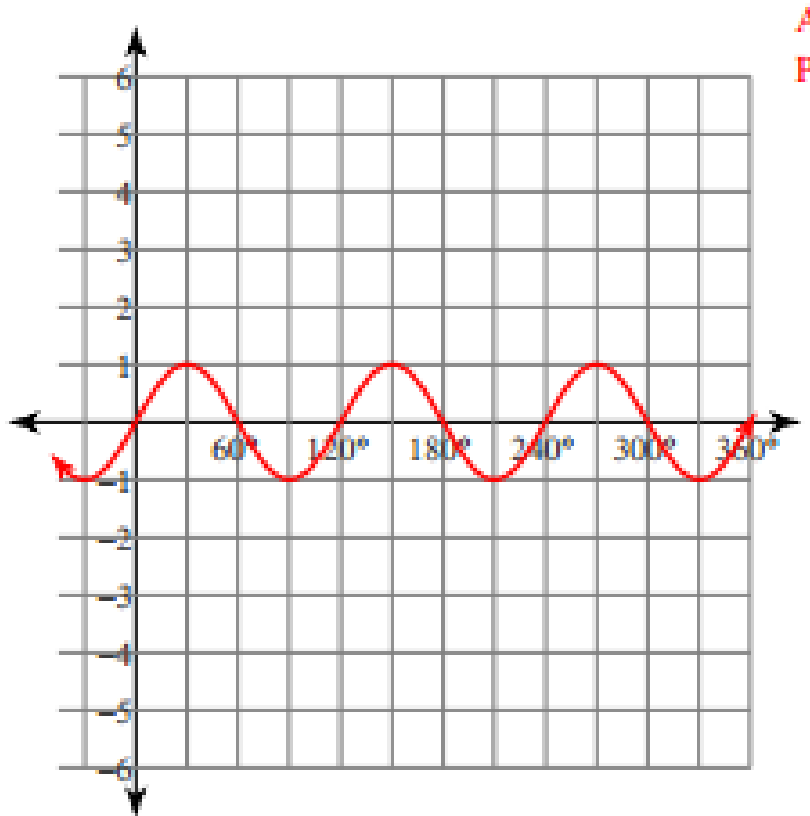
$$644.74 \text{ ft}$$

**Done early?  
Start the table  
below the  
questions!**

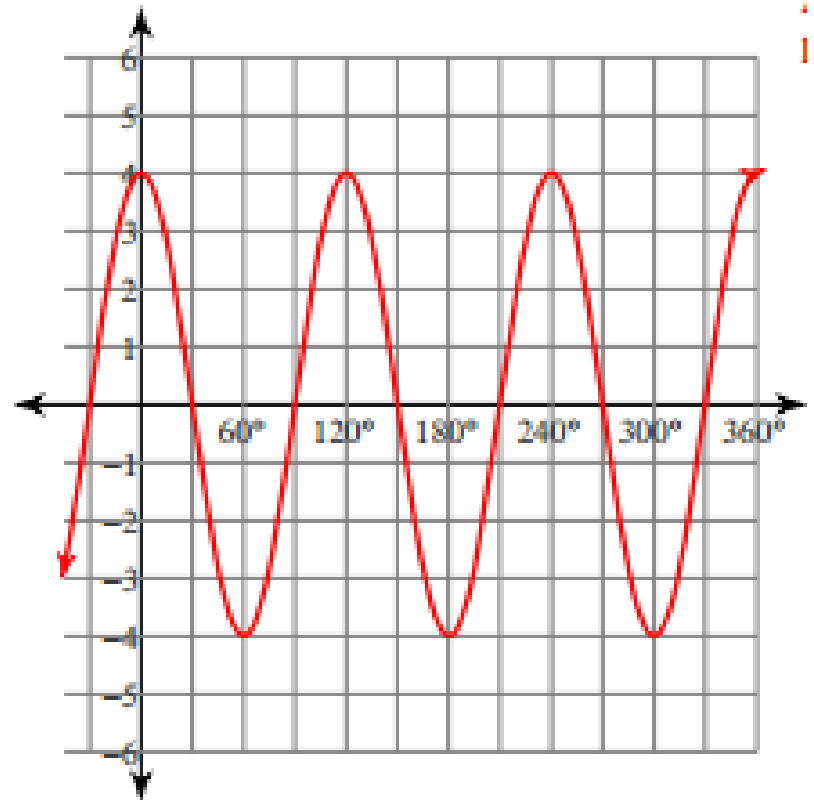
# Homework Answers

## Packet p. 21 Part II

1)  $y = \sin 3\theta$

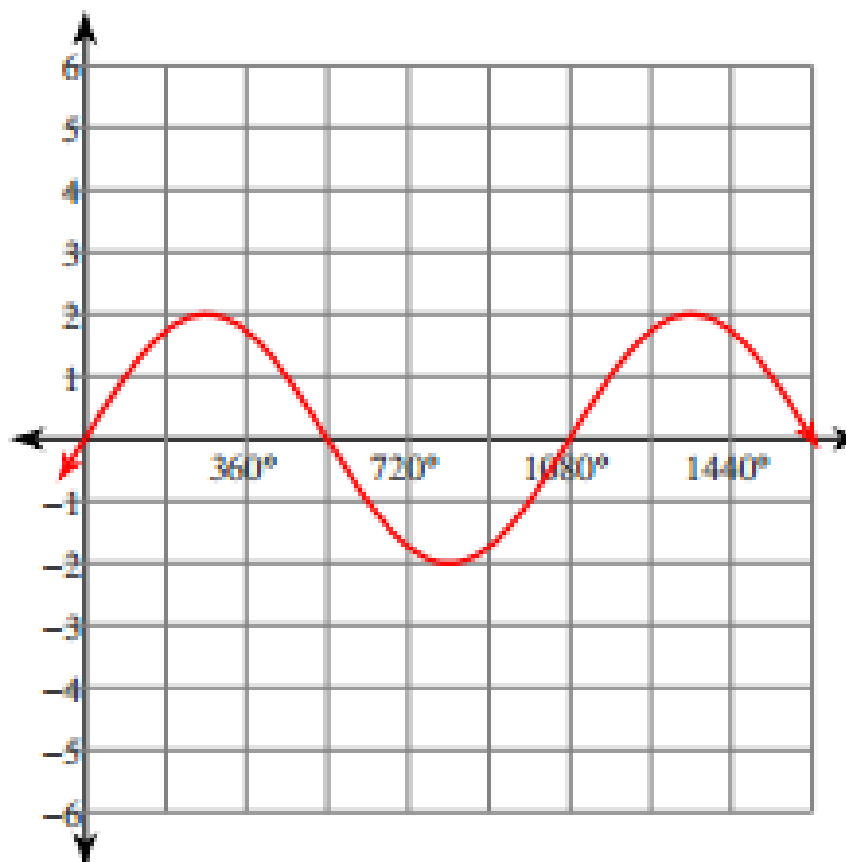


2)  $y = 4\cos 3\theta$

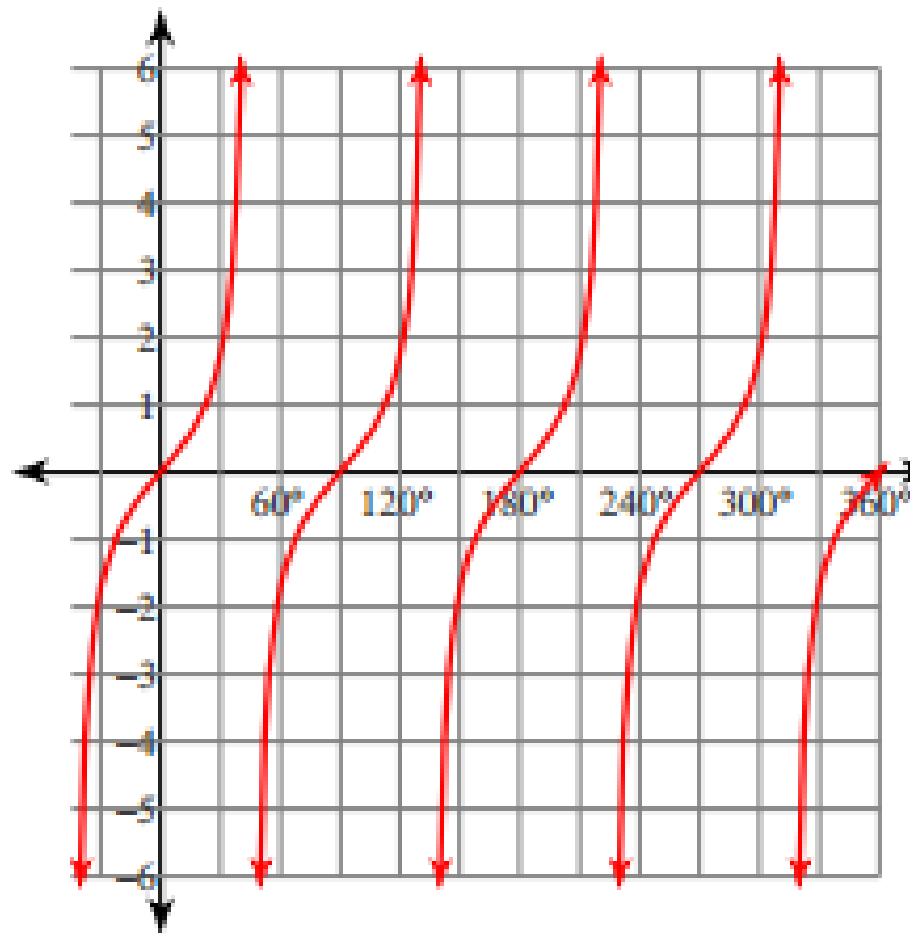


# Homework Answers

3)  $y = 2\sin \frac{\theta}{3}$

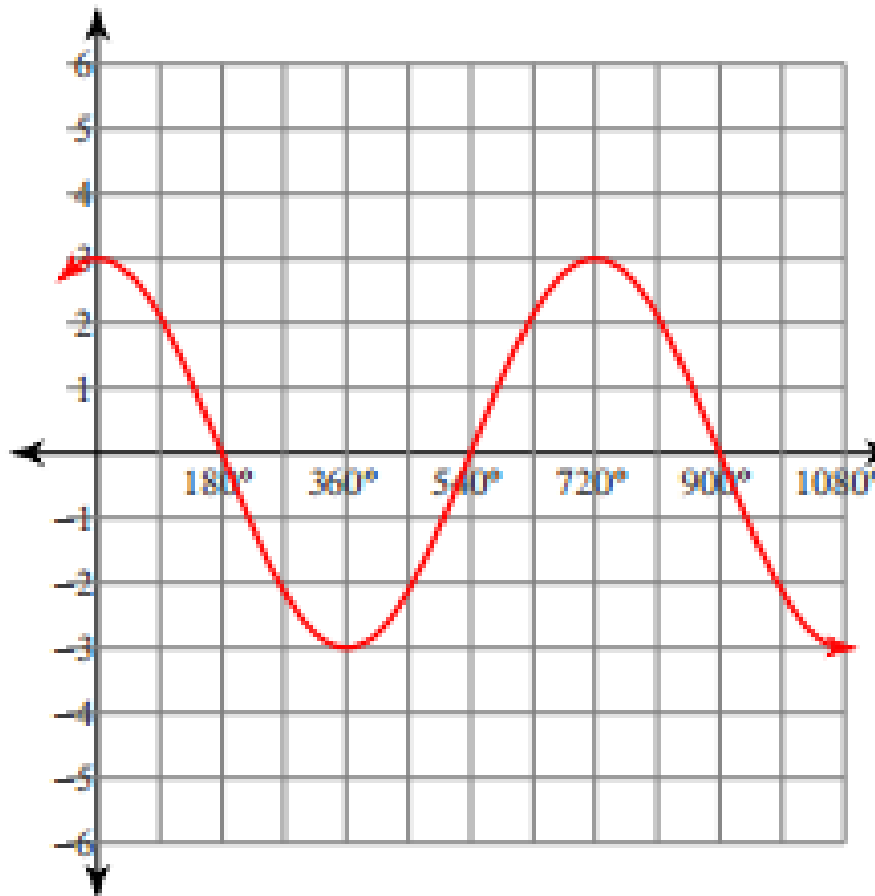


4)  $y = \tan 2\theta$

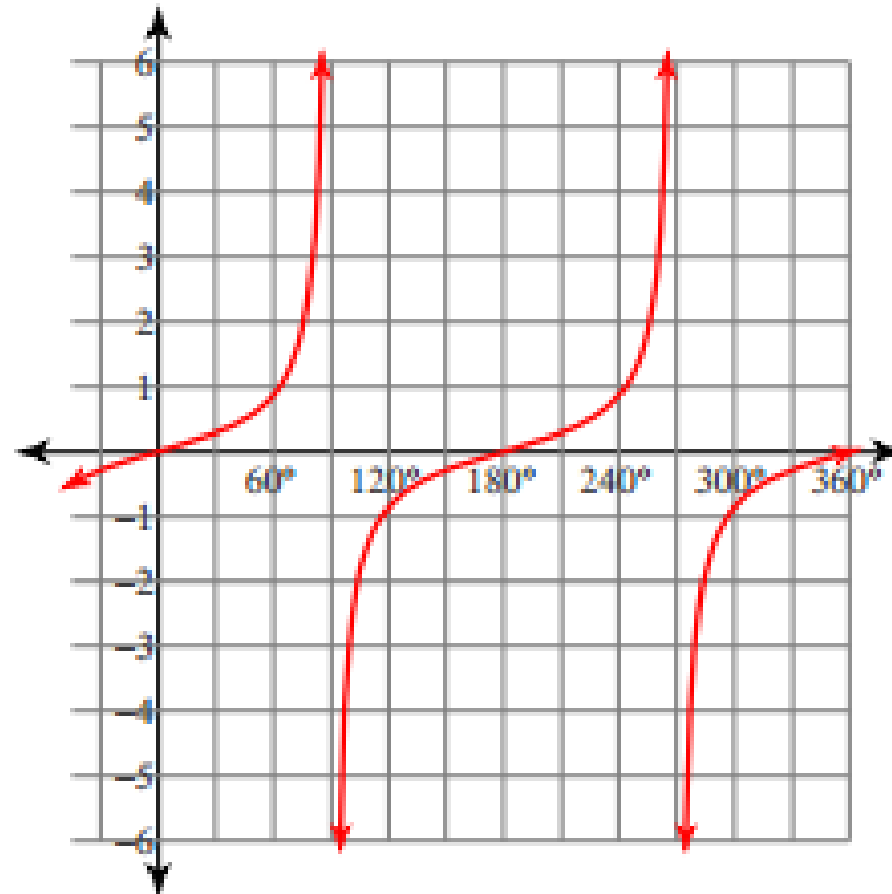


# Homework Answers

5)  $y = 3\cos \frac{\theta}{2}$



6)  $y = \frac{1}{2}\tan \theta$



# Homework Answers Packet p. 23-24

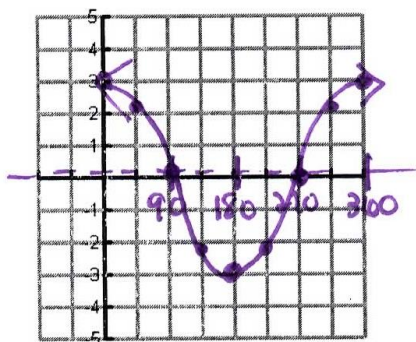
For each function, find the amplitude, period, and midline then graph one cycle. Remember to label your axis!

1.  $y = 3\cos(\theta)$

Amp. = 3 | 3 |

Per. =  $360^\circ$   $\frac{360}{1}$

Midline:  $y=0$

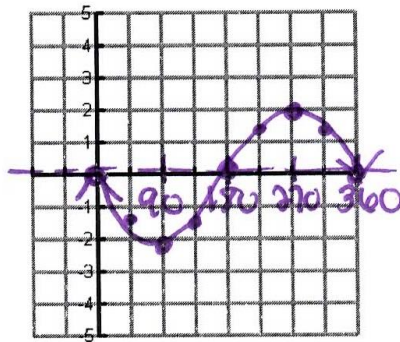


2.  $y = -2\sin(\theta)$

Amp. = 2 | 2 |

Per. =  $360^\circ$   $\frac{360}{1}$

Midline:  $y=0$

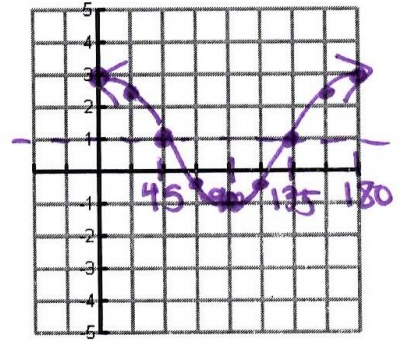


3.  $y = 2\cos(2\theta) + 1$

Amp. = 2 | 2 |

Per. =  $180^\circ$   $\frac{360}{2}$

Midline:  $y=1$

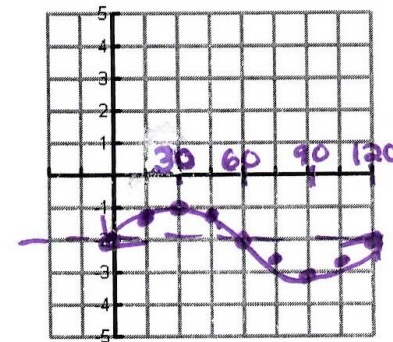


4.  $y = \sin(3\theta) - 2$

Amp. = 1 | 1 |

Per. =  $120^\circ$   $\frac{360}{3}$

Midline:  $y=-2$



5)  $B = 117^\circ$ ,  $c = 5.3$ ,  $a = 8.7$

6)  $A = 46^\circ$ ,  $B = 60^\circ$ ,  $C = 74^\circ$

7) No Solution (No triangle is possible because side b is too short)

8)  $a = 40.5$ ,  $B = 52^\circ$ ,  $C = 75^\circ$

# Homework Answers

9) Amp = 4, Period =  $12^\circ$ , Midline:  $y = 9$

10) 22.7 feet

11) 19.2 feet

12) Isosceles acute triangle

13) Scalene obtuse triangle

14) Equilateral equiangular  $\Delta$

15) Scalene right triangle

16) Isosceles obtuse triangle

17) Equilateral equiangular  $\Delta$

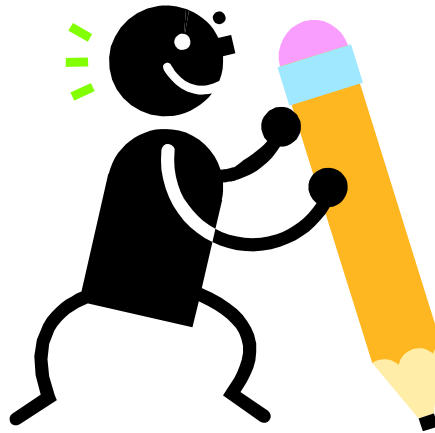
18) Isosceles obtuse triangle

19) Equilateral equiangular  $\Delta$

20) Scalene obtuse triangle

# Tonight's Homework

**Packet p. 19-20  
AND Study for Quiz 2**





# Notes p. 25 (below warm-up)

## Remember!!!

- a. Angles are measured in **radians or degrees**
- b. We have to check our mode to make sure the calculator knows what measure we are using!
  - i. In this class, we will always use **degrees** , but you should know that radians exist!



→ Make sure degree is highlighted

# Notes continued

## Solving Sine, Cosine and Tangent Equations

1. We can solve equations involving sine, cosine and tangent just like any other equation!

2. Inverse operations of sine, cosine and tangent

- i. Sine  $\rightarrow$   $\text{Sin}^{-1}$
- ii. Cosine  $\rightarrow$   $\text{Cos}^{-1}$
- iii. Tangent  $\rightarrow$   $\text{Tan}^{-1}$

# Solving Trig Equations

Use the inverse trig functions on your calculator to solve the following equations:

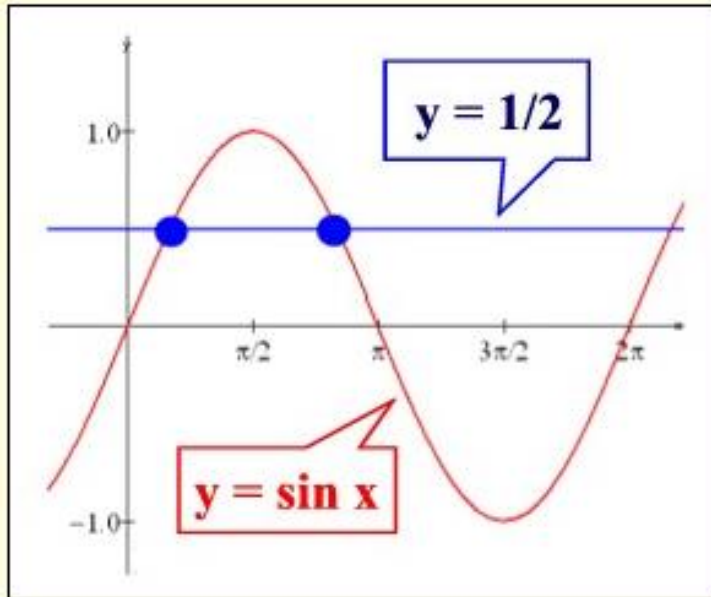
a.  $\sin(x) = 0.3$       $x = 17.46^\circ$

b.  $\sin(x + 2) = 1.5$      **No solution-** sine is always between -1 and 1

c.  $3 \sin(x) = 2$       $x = 41.81^\circ$

**Remember to always  
isolate BEFORE doing the  
Inverse! 😊**

Sometimes, there are more than one answer.  
In Honors Math 2, we're only going to talk about one of them



$$2\sin x - 1 = 0$$

$$2\sin x = 1$$

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



# You Try:

Solve the equations and express your answer to the nearest tenth degree:

1.  $\sin(x) = 0.6$

$x = 36.9^\circ$

2.  $\cos(x) = 1.5$

No solution

3.  $\tan(x) = -6.7$

$x = -81.5^\circ$

4.  $\cos(x) = -0.87$

$x = 150.5^\circ$

5.  $3\sin(x) = 1.5$

$x = 30^\circ$

6.  $4\sin(x) = 1.2$

$x = 17.5^\circ$

# More Practice at the top of pg. 30 (if time allows)

Solve the following equations and express your answer to the nearest tenth degree:

1) $\sin(x) = 0.8$ $x = 53.1^\circ$	2) $\cos(x) = -0.78$ $x = 141.3^\circ$	3) $\tan(x) = -9.5$ $x = -84^\circ$	4) $\sin(x) = 0.366$ $x = 21.5^\circ$
5) $\sin(x) = -0.768$ $x = -50.2^\circ$	6) $3\tan(x) = -12.8$ $x = -76.8^\circ$	7) $3\sin(x) + 4 = 1.57$ $x = -54.1^\circ$	8) $4\cos(x) - 6 = -5.2$ $x = 78.5^\circ$

# On Notebook Paper: Solving more involved Trigonometric Equations

Together!

$$1) \sin(x) - \frac{\sqrt{3}}{2} = 0$$

$$x = 60^\circ$$

$$2) 2\sin(x)\cos(x) = \sqrt{3}\sin x$$

Sometimes, we have to factor. Set equation = 0, then factor out  $\sin(x)$  which is our GCF! 😊

$$x = 0^\circ \text{ or } 30^\circ$$

# On Notebook Paper: Solving more involved Trigonometric Equations

You Try!

$$3) \quad 2 \cos(x) - 1 = 0$$

$$4) \quad 3 \cos(x) + 2 = 2 \cos x + 1$$

$$x = 60^\circ$$

$$x = 180^\circ$$



# On Notebook Paper: Solving *even more* involved trigonometric Equations

Together!

$$1) \cos(2x) - \frac{\sqrt{3}}{2} = 0$$

$$2) \sin^2(x) = 1$$

Remember  
the difference  
of squares?

$$x = 15^\circ$$

$$x = 90^\circ \text{ or } -90^\circ$$

Remember to isolate first, then do the inverse.  
Show your work as you go because sometimes there  
are steps AFTER you take the inverse! 😊

# Notes p. 30 Solving *even more* involved trigonometric Equations

You Try!

$$3) 2 \sin(x) \cos(x) = \sqrt{2} \cos x$$

$$4) \sin(3x) + \frac{1}{2} = 0$$

$$x = 90^\circ \text{ or } 45^\circ$$

$$x = -10^\circ$$

# An Exploration

- **Work with your partner**
- **Raise your hand when you are finished**

**Notes p. 30 - 31**

# Practice and further exploration

Use your graphing calculator to answer the following questions.

1. Use your calculator to find the following trig ratios. Round your answers to the nearest thousandth.

$\sin(20) = 0.342$	$\cos(40) = 0.766$	$\tan(70) = 2.747$
$\sin(83) = 0.616$	$\cos(75) = 0.259$	$\tan(25) = 0.466$

2. Find the sine, cosine, and tangent of a right triangle with a hypotenuse of 1 and angle of elevation of  $45^\circ$ .

- a) What is the sine of  $45^\circ$ , rounded to the nearest thousandth? 0.707
- b) What is the cosine of  $45^\circ$ , rounded to the nearest thousandth? 0.707
- c) What is the tangent of  $45^\circ$ , rounded to the nearest thousandth? 1
- d) What is special about the sine and cosine of  $45^\circ$ ?

$\sin(45)$  and  $\cos(45)$  are equal

- e) What is special about the tangent of  $45^\circ$ ?  
 $\tan(45) = 1$

3. Use your calculator to find the following sine and cosine ratios.

$\cos(20) = 0.94$	$\cos(30) = 0.866$
$\sin(70) = 0.94$	$\sin(60) = 0.866$
$\cos(60) = 0.5$	$\cos(75) = 0.259$
$\sin(30) = 0.5$	$\sin(15) = 0.259$

What do you notice about sine and cosine when the angles add to  $90^\circ$ ? They are equal

4. Use your calculator to find the following:

$\tan(40) = 0.839$	$\frac{\sin(40)}{\cos(40)} = 0.839$	$\tan(50) = 1.192$	$\frac{\sin(50)}{\cos(50)} = 1.192$
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What conclusion can you draw about the relationship between the tangent function and sine and cosine?

# Homework

Packet p. 19-20

