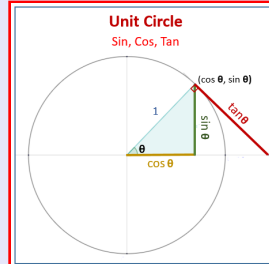


# Trigonometry

## Lecture 40



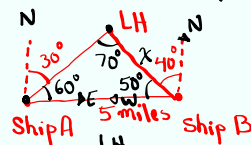
Feb 19-8:47 AM

Class QZ 8

Ship A has bearing of  $N 30^\circ E$  for a light house.

Ship B is 5 miles east of ship A and has a bearing of  $N 40^\circ W$  for the same lighthouse.

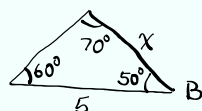
How far is ship B from the lighthouse.  
Drawing Required.



$$\frac{\sin 70^\circ}{5} = \frac{\sin 60^\circ}{x}$$

$$x = \frac{5 \sin 60^\circ}{\sin 70^\circ} \quad x \approx 4.6 \text{ miles}$$

$$x \approx 5 \text{ miles}$$



Nov 7-11:30 AM

Intro to inverse functions.

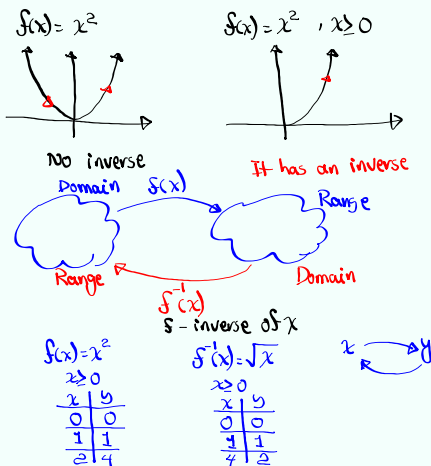
Not every function has an inverse.

Increasing functions have inverse.

Decreasing " " " "

Functions that increase and decrease

can have inverse once we modify the domain



Nov 12-10:29 AM

Find find  $f^{-1}(x)$  for  $f(x) = 2x - 4$

$$f(x) = 2x - 4$$

$$y = 2x - 4$$

$$y \rightarrow x$$

$$x \rightarrow y$$

$$x = 2y - 4$$

$$x + 4 = 2y$$

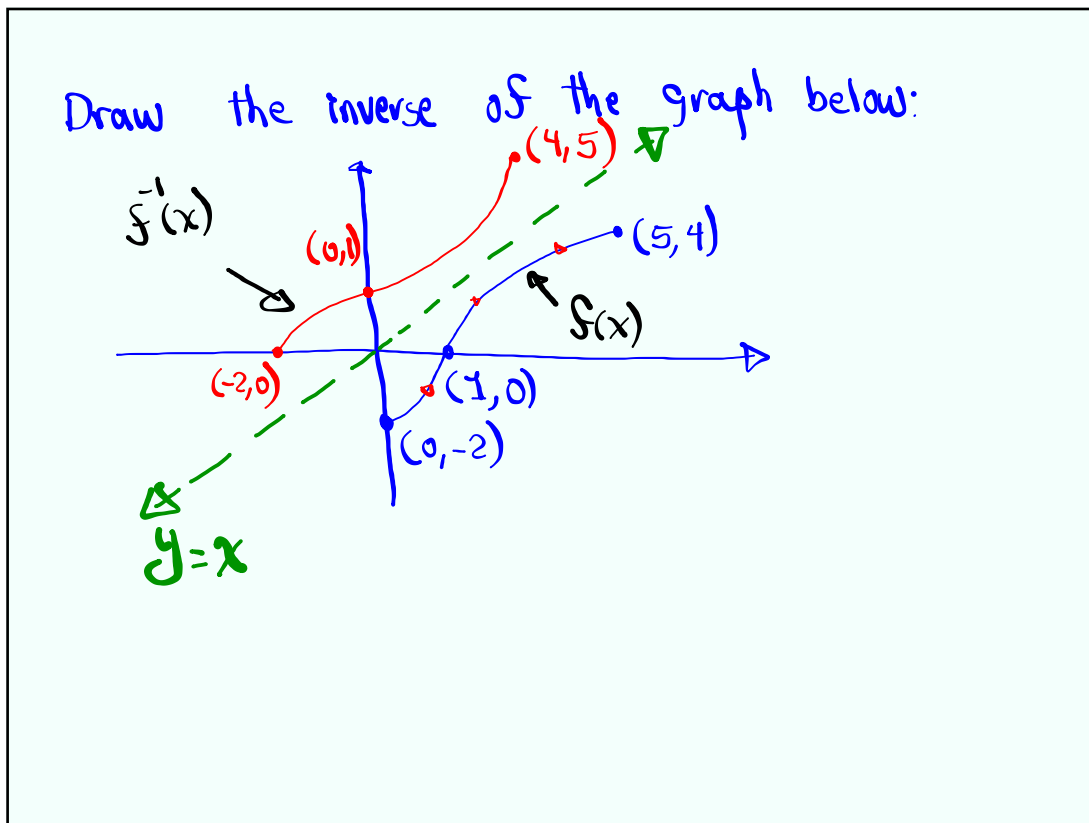
$$y = \frac{x+4}{2}$$

$$f^{-1}(x) = \frac{x+4}{2}$$

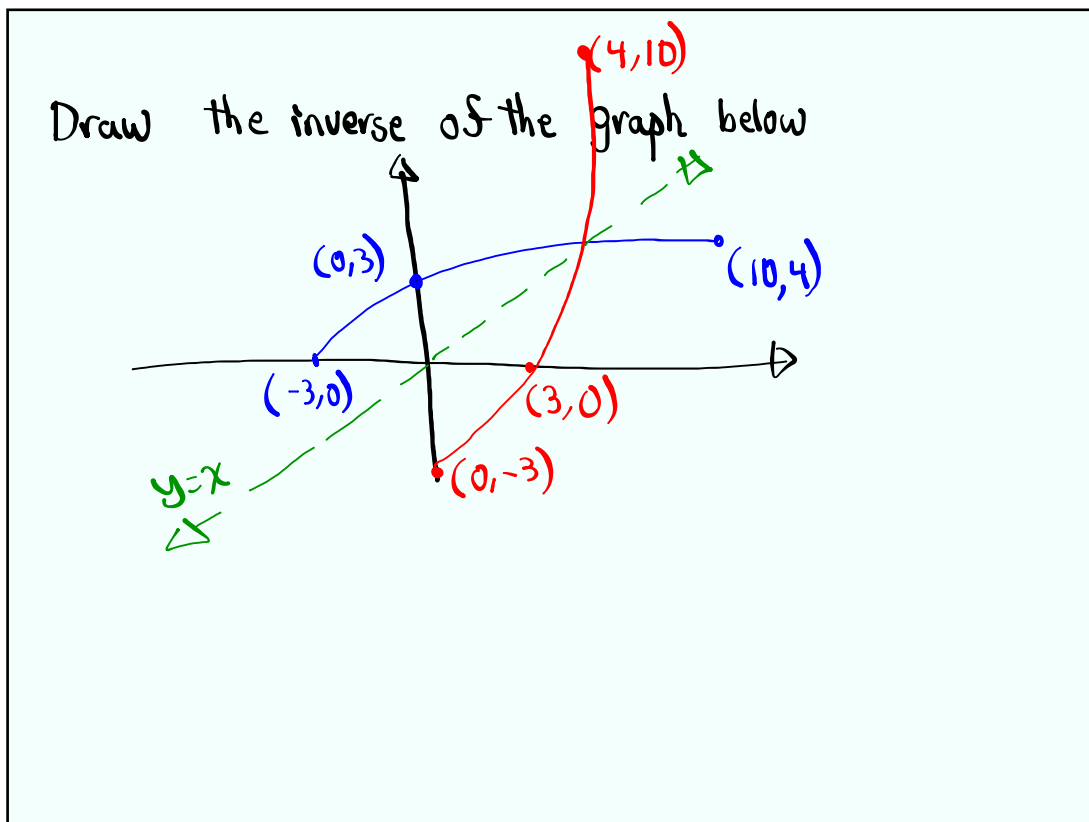
x	y
0	-4
1	-2
2	0
5	6

x	y
-4	0
-2	1
0	2
6	5

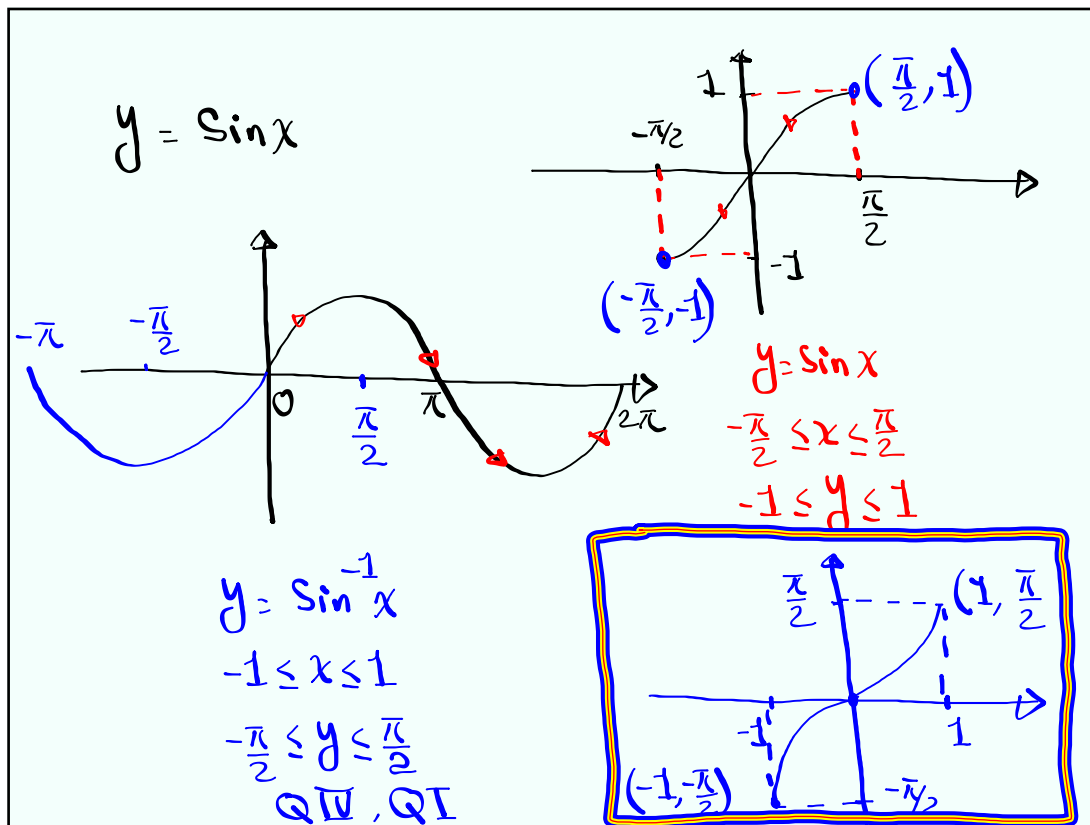
Nov 12-10:36 AM



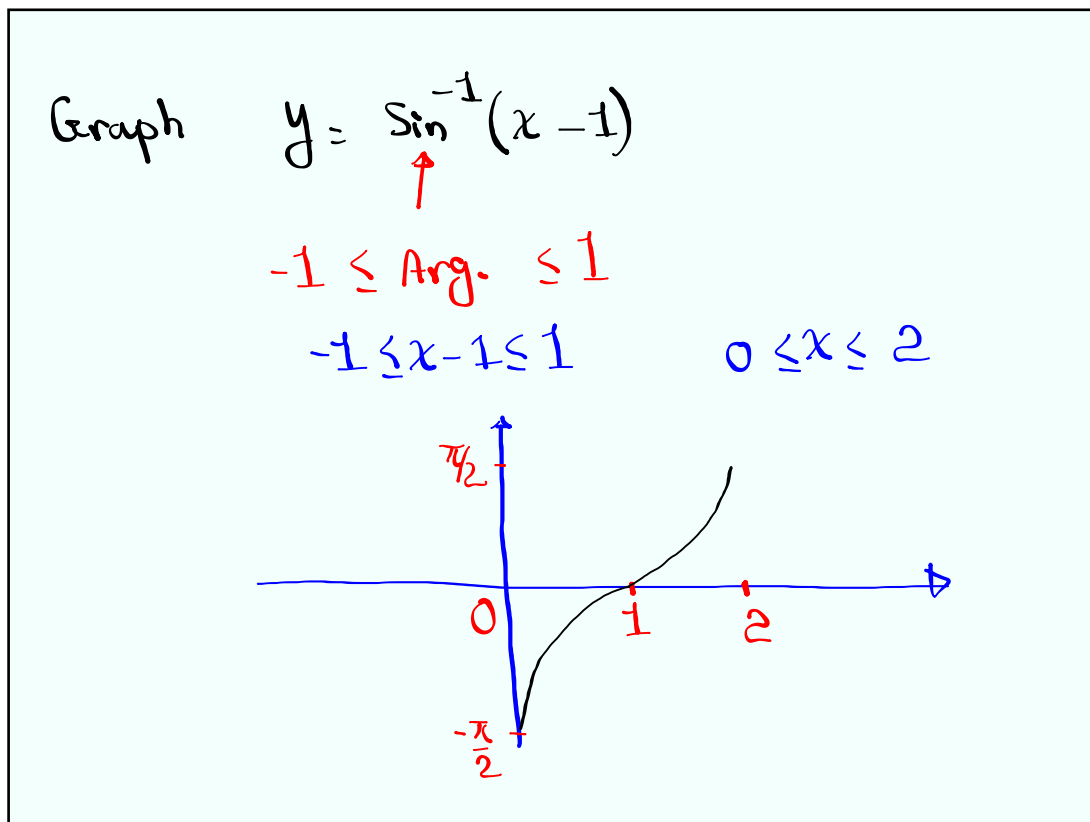
Nov 12-10:40 AM



Nov 12-10:43 AM



Nov 12-10:47 AM



Nov 12-10:53 AM

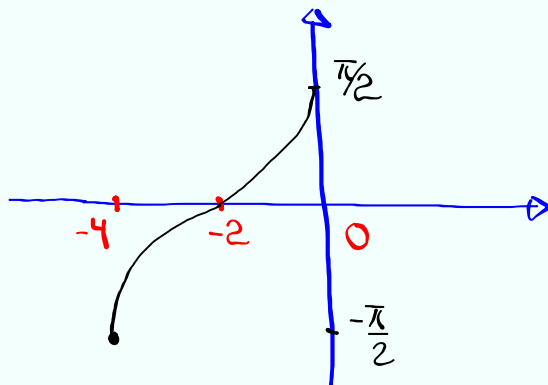
Graph  $y = \sin^{-1}\left(\frac{1}{2}x + 1\right)$

$$-1 \leq \text{Arg.} \leq 1$$

$$-1 \leq \frac{1}{2}x + 1 \leq 1$$

$$-2 \leq \frac{1}{2}x \leq 0$$

$$-4 \leq x \leq 0$$



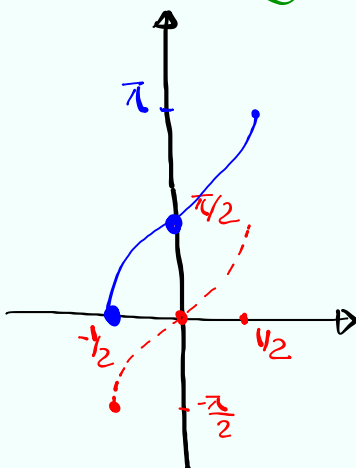
Nov 12-10:55 AM

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

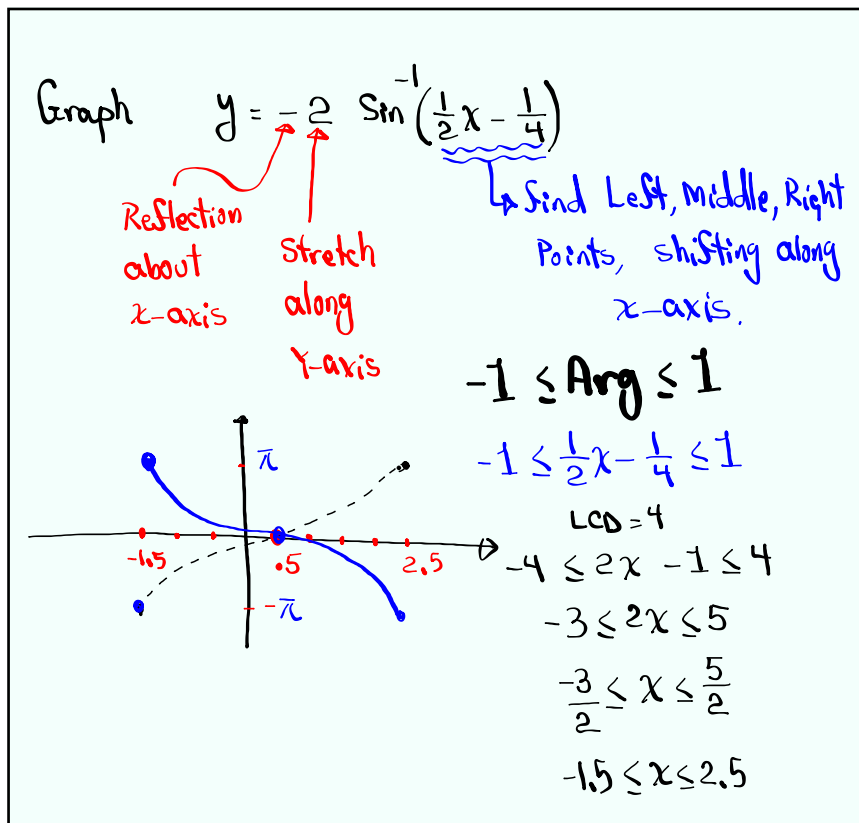
$$-1 \leq \text{Arg.} \leq 1$$

$$-1 \leq 2x \leq 1$$

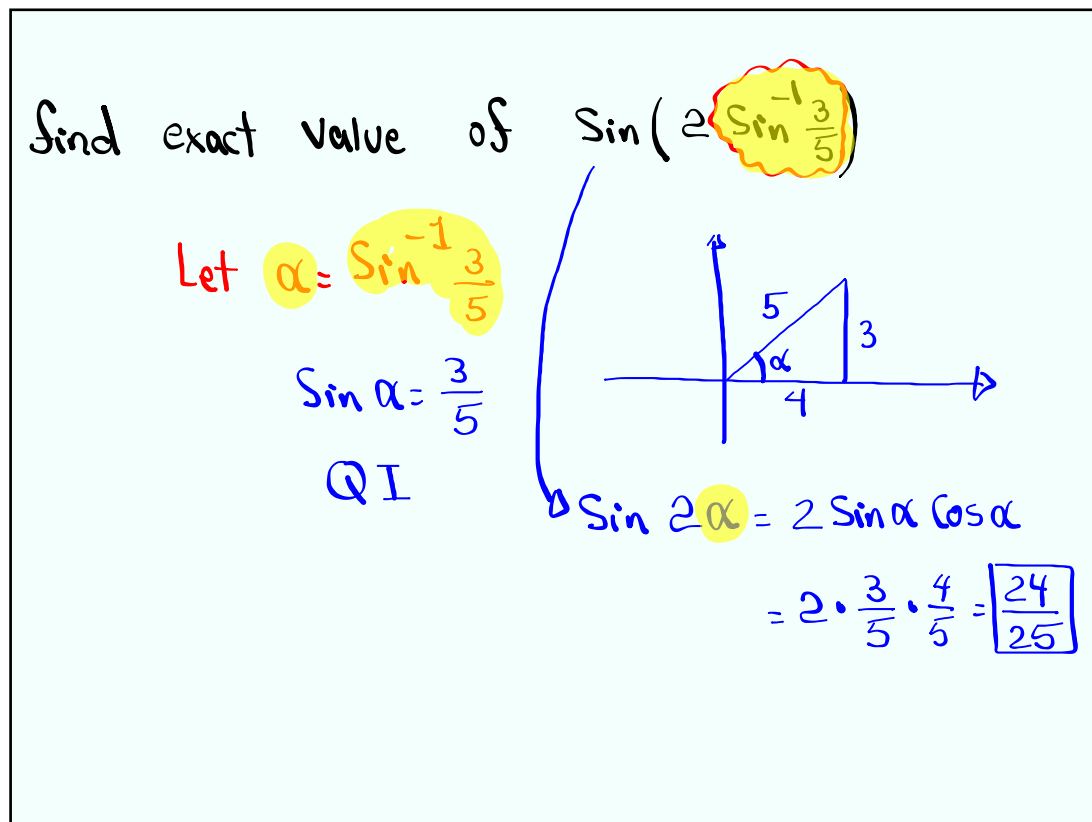
$$-\frac{1}{2} \leq x \leq \frac{1}{2}$$



Nov 12-10:58 AM



Nov 12-11:02 AM



Nov 12-11:09 AM

Find exact value of

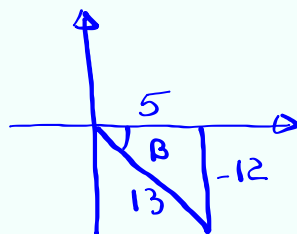
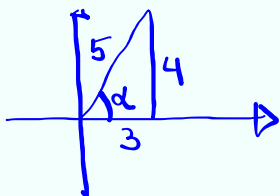
$$\sin\left(\sin^{-1}\frac{4}{5} - \sin^{-1}\frac{12}{13}\right) = \sin(\alpha - \beta)$$

$$\alpha = \sin^{-1}\frac{4}{5}$$

$$\sin\alpha = \frac{4}{5}$$

$$\beta = \sin^{-1}\frac{12}{13}$$

$$\sin\beta = \frac{12}{13}$$



$$= \sin\alpha \cos\beta - \cos\alpha \sin\beta$$

$$= \frac{4}{5} \cdot \frac{5}{13} - \frac{3}{5} \cdot \frac{12}{13}$$

$$= \frac{20}{65} - \frac{36}{65} = \boxed{\frac{56}{65}}$$

Nov 12-11:14 AM

Find exact value for

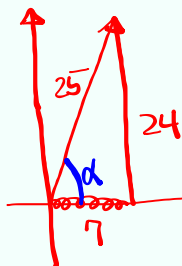
$$\sin\left(\frac{1}{2} \sin^{-1}\frac{24}{25}\right) = \sin\frac{\alpha}{2} \Rightarrow \pm \sqrt{\frac{1 - \cos\alpha}{2}}$$

$$0^\circ < \alpha < 90^\circ$$

$$0^\circ < \frac{\alpha}{2} < 45^\circ$$

$$\alpha = \sin^{-1}\frac{24}{25}$$

$$\sin\alpha = \frac{24}{25}$$



$$= + \sqrt{\frac{1 - \frac{7}{25}}{2}}$$

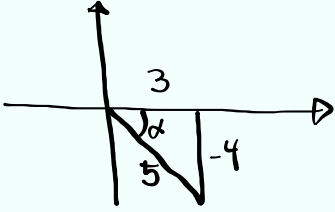
$$= \sqrt{\frac{25 - 7}{50}}$$

$$= \sqrt{\frac{18}{50}} = \sqrt{\frac{9}{25}}$$

$$= \boxed{\frac{3}{5}}$$

Nov 12-11:19 AM

Find exact value of

$$\sin\left(\frac{1}{2} \sin^{-1} \frac{-4}{5}\right) = \sin\left(\frac{\alpha}{2}\right)$$


$$\alpha = \sin^{-1} \frac{-4}{5}$$

$$\sin \alpha = \frac{-4}{5}$$

Q IV  
 $270^\circ < \alpha < 360^\circ$   
 $135^\circ < \frac{\alpha}{2} < 180^\circ$   
 Q II

$$= + \sqrt{\frac{1 - \cos \alpha}{2}}$$

$$= + \sqrt{\frac{1 - \frac{3}{5}}{2}} = \sqrt{\frac{5-3}{10}}$$

$$= \sqrt{\frac{2}{10}}$$

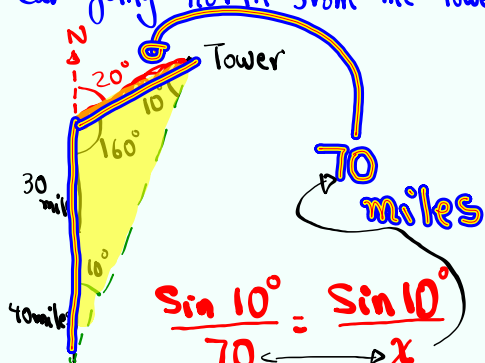
$$= \sqrt{\frac{1}{5}} = \boxed{\frac{\sqrt{5}}{5}}$$

Nov 12-11:24 AM

one car is going north at 30 mph, spots a tower with  $20^\circ$  bearing after one hr.

another car leaves same time going south with  $10^\circ$  bearing of the same tower after one hr.

How far is the car going north from the tower after one hr?



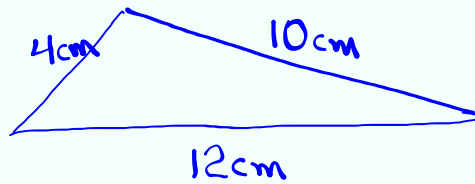
both cars  
 30 mph  
 40 mph

$$\frac{\sin 10^\circ}{70} = \frac{\sin 10^\circ}{x}$$

Nov 12-11:30 AM



Find the area:



Heron's Formula

$$S = \frac{a+b+c}{2}$$

$$S = 13$$

$$\text{Area} = \sqrt{S(S-a)(S-b)(S-c)} = \sqrt{13(13-12)(13-4)(13-10)}$$

$$= \sqrt{13 \cdot 1 \cdot 9 \cdot 3}$$

$$= \sqrt{351} \approx 19 \text{ cm}^2$$

Nov 12-11:39 AM