

1. If (3,-7) is a point on the terminal side of an angle θ , find the exact value of each of the six trigonometric functions.

$$\sin \theta = \frac{-7}{\sqrt{58}}$$

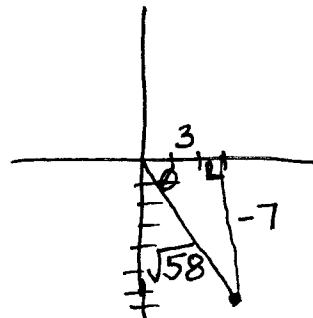
$$\cos \theta = \frac{3}{\sqrt{58}}$$

$$\tan \theta = -\frac{7}{3}$$

$$\csc \theta = \frac{\sqrt{58}}{-7}$$

$$\sec \theta = \frac{\sqrt{58}}{3}$$

$$\cot \theta = -\frac{3}{7}$$



2. In what quadrant is...

a. $\cos \theta > 0$ and $\tan \theta < 0$

IV

b. $\cot \theta > 0$ and $\sec \theta < 0$

III

3. Find the exact value of each of the remaining trig functions of θ .

a. $\cos \theta = -3/5$, $\theta =$ quadrant III

$$\sin \theta = \frac{4}{5} \quad \csc \theta = \frac{5}{4} \quad \cot \theta = \frac{3}{4}$$

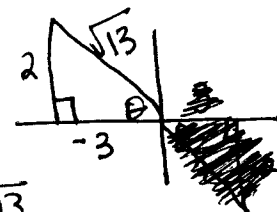
$$\tan \theta = \frac{4}{3} \quad \sec \theta = -\frac{5}{3}$$

b. $\tan \theta = -2/3$, $\sin \theta > 0$

$$\sin \theta = \frac{2}{\sqrt{13}} \quad \cot \theta = -\frac{3}{2}$$

$$\cos \theta = -\frac{3}{\sqrt{13}} \quad \csc \theta = \frac{\sqrt{13}}{2}$$

$$\sec \theta = -\frac{\sqrt{13}}{3}$$



4. Find the reference angle for the following:

a. -230°

50°

b. $\frac{31\pi}{9}$

80°

c. 640°

80°

5. Find a positive and negative conterminal angle for each given angle.

* Answers vary *

a. -330°

$30^\circ, -690^\circ$

b. 640°

$-80^\circ, 280^\circ$

c. $\frac{5\pi}{4}$, $\frac{13\pi}{4}$, $-\frac{3\pi}{4}$

6. Given θ , determine the exact value of each of the trig ratios.

a. 240°

$$\sin \theta = -\frac{\sqrt{3}}{2} \quad \csc \theta = -\frac{2}{\sqrt{3}}$$

$$\cos \theta = -\frac{1}{2} \quad \sec \theta = -2$$

$$\tan \theta = \sqrt{3} \quad \cot \theta = \frac{1}{\sqrt{3}}$$

b. $\theta = \frac{3\pi}{4}$

$$\sin \theta = \frac{\sqrt{2}}{2} \quad \csc \theta = \frac{2}{\sqrt{2}}$$

$$\cos \theta = -\frac{\sqrt{2}}{2} \quad \sec \theta = -\frac{2}{\sqrt{2}}$$

$$\tan \theta = -1 \quad \cot \theta = -1$$

7. Find the following values:

$\sin 120^\circ = \frac{\sqrt{3}}{2}$

$\cos(-\frac{\pi}{4}) = \frac{\sqrt{2}}{2}$

$\csc \frac{\pi}{3} = \frac{2}{\sqrt{3}}$

$\tan 450^\circ = \text{undefined}$

$\sec(-180^\circ) = -1$

$\cot \frac{3\pi}{4} = -1$

8. Convert 110° to radians.

$$110^\circ \cdot \frac{\pi}{180^\circ} = \frac{11\pi}{18}$$

9. Convert $\frac{2\pi}{15}$ to degrees.

$$\frac{2\pi}{15} \cdot \frac{180^\circ}{\pi} = \boxed{24^\circ}$$

10. Find the following values:

a. $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$
 $-\frac{\pi}{3}$

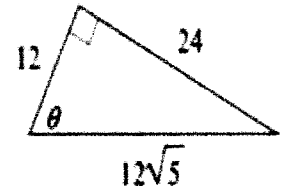
b. $\cos^{-1}\left(\frac{1}{2}\right)$
 $\frac{\pi}{3}$

c. $\tan^{-1}(-1)$
 $-\frac{\pi}{4}$

11. Use the triangle to find the exact value of the 6 trigonometric ratios:

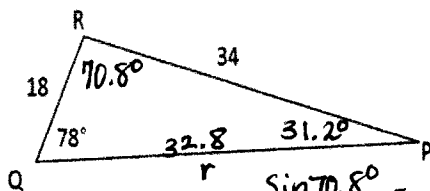
$\sin \theta: \frac{24}{12\sqrt{5}} = \frac{2}{\sqrt{5}}$ $\cos \theta: \frac{12}{12\sqrt{5}} = \frac{1}{\sqrt{5}}$ $\tan \theta: \frac{24}{12} = 2$

$\csc \theta: \frac{\sqrt{5}}{2}$ $\sec \theta: \sqrt{5}$ $\cot \theta: \frac{1}{2}$



12. Find the missing angles and sides for each triangle.

a.



$$\frac{\sin 70^\circ}{34} = \frac{\sin P}{18}$$

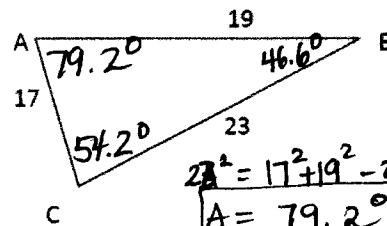
$$\frac{\sin 70.8^\circ}{r} = \frac{\sin 78^\circ}{34}$$

$$r = \frac{34 \sin 70.8^\circ}{\sin 78^\circ} = \boxed{32.8}$$

$$P = \sin^{-1}\left(\frac{18 \sin 70^\circ}{34}\right) = \boxed{31.2^\circ}$$

$$R = 180^\circ - 78^\circ - 31.2^\circ = \boxed{70.8^\circ}$$

b.



$$23^2 = 17^2 + 19^2 - 2(17)(19)\cos A$$

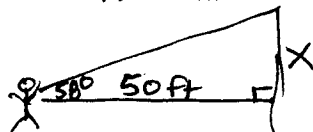
$$\boxed{A = 79.2^\circ}$$

$$19^2 = 17^2 + 23^2 - 2(17)(23)\cos C$$

$$\boxed{C = 54.2^\circ}$$

$$B = 180^\circ - 54.2^\circ - 79.2^\circ = \boxed{46.6^\circ}$$

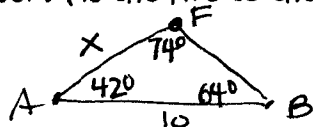
13. You are 50 feet from the screen at a drive-in movie. Your eye is on a horizontal line with the bottom of the screen and the angle of elevation to the top of the screen is 58° . How tall is the screen?



$$\tan 58^\circ = \frac{x}{50}$$

$$\boxed{x = 80.02 \text{ ft}}$$

14. Fire towers A and B are located 10 miles apart. Rangers at fire tower A spot a fire at 42° . Rangers at fire tower B spot the same fire at 64° . How far from tower A is the fire to the nearest tenth of a mile?



$$\angle F = 74^\circ$$

$$\frac{\sin 74^\circ}{10} = \frac{\sin 64^\circ}{x}$$

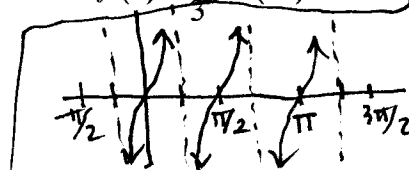
$$\boxed{x = 9.35 \text{ miles}}$$

15. Sketch the following functions. Specify the domain, range, amplitude, period, phase shift, and asymptotes if applicable. Identify the parent function, and list the transformations on the parent function to obtain the given function.

a. $g(x) = -3\sin(x - \pi)$

for 15a & b, see next page

b. $f(x) = \frac{1}{3}\cos(3x) - 2$



c. $g(x) = 3\tan 2x$

parent $y = \tan x$
horiz stretch #2
vert stretch #3
D: $x \neq k \cdot \pi/4$ k is odd integer
R: $(-\infty, \infty)$
amp: none
per = $\frac{\pi}{2}$
phase shift: none
asymptotes: $x = k\pi/4$ k odd integer

15a $g(x) = -3 \sin(x - \pi)$

D: $(-\infty, \infty)$

R: $[-3, 3]$

amp = $|-3| = 3$

period = $\frac{2\pi}{1} = 2\pi$

phase shift = $\frac{-(-\pi)}{1} = \pi$

no asymptotes

parent $y = \sin x$

horiz. shift rt. π

vert. stretch $\times 3$

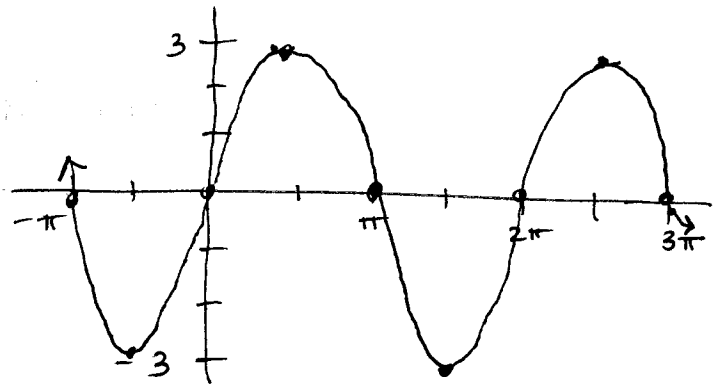
refl over x-axis

$y = \sin x$

0	0
$\pi/2$	1
π	0
$3\pi/2$	-1
2π	0

$g(x)$

π	0
$3\pi/2$	-3
2π	0
$5\pi/2$	3
3π	0



15b $f(x) = \frac{1}{3} \cos(3x) - 2$

D: $(-\infty, \infty)$

R: $[-\frac{5}{3}, -\frac{7}{3}]$

amp = $|\frac{1}{3}| = \frac{1}{3}$

period = $\frac{2\pi}{3}$

phase shift: none

no asymptotes

parent $y = \cos x$

horiz. shrink $\times \frac{1}{3}$

vert. shrink $\times \frac{1}{3}$

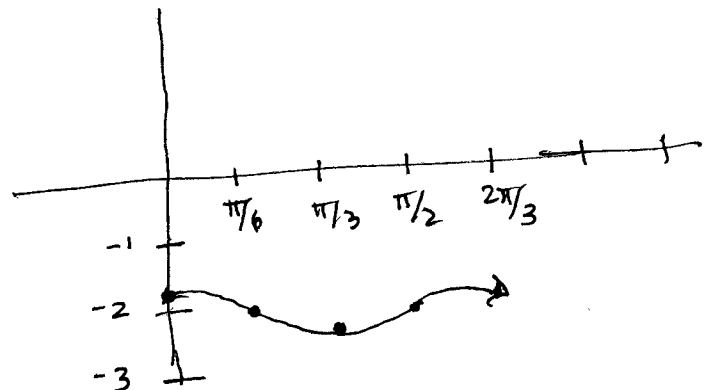
vert. shift down 2

$y = \cos x$

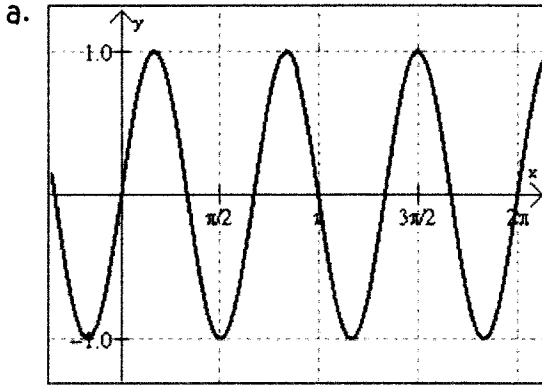
0	1
$\pi/2$	0
π	-1
$3\pi/2$	0
2π	1

$f(x)$

0	$-1\frac{2}{3}$
$\pi/6$	-2
$\pi/3$	$-2\frac{1}{3}$
$\pi/2$	-2
$2\pi/3$	$-1\frac{2}{3}$



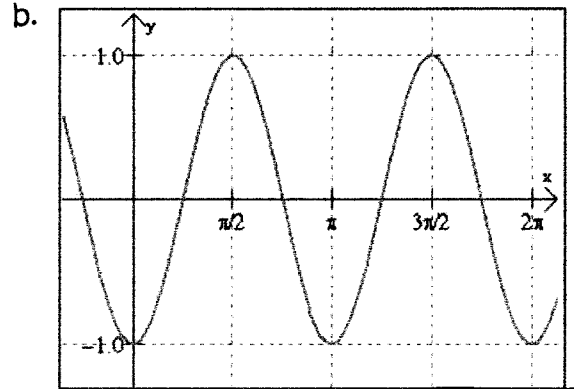
16. Find the equation of the following graphs:



amp = 1
not refl.

$$y = \sin 3x$$

$$\text{per} = \frac{2\pi}{3} \quad \frac{2\pi}{B} = \frac{2\pi}{3} \quad B = 3$$



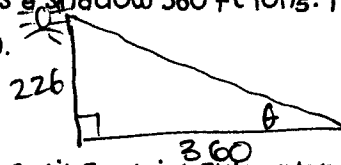
amp = 1
refl.

$$y = -\cos 2x$$

$$\text{per} = \pi \quad \frac{2\pi}{B} = \pi$$

$$\pi B = 2\pi \quad B = 2$$

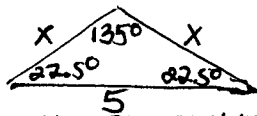
17. A pillar of height 226 ft casts a shadow 360 ft long. Find the measure of the angle of elevation of the sun.



$$\tan \theta = \frac{226}{360}$$

$$\theta = 32.12^\circ$$

18. Lilly is a landscaper who is creating a triangular planting garden. The homeowner wants the garden to have two equal sides and contain an angle of 135° . The longest side of the garden must be exactly 5 m. How long is the plastic edging that Lilly needs to surround the garden?



$$180^\circ - 135^\circ = 45^\circ$$

$$\div 2 = 22.5^\circ$$

$$\frac{\sin 22.5^\circ}{x} = \frac{\sin 135^\circ}{5}$$

$$x = \frac{5 \sin 22.5^\circ}{\sin 135^\circ} = 2.71$$

$$\text{perimeter} = 5 + 2(2.71)$$

$$= 10.4 \text{ m}$$

19. The average monthly temperature in Savannah is given in the table below.

Month	Jan. 1	Feb. 2	Mar. 3	Apr. 4	May 5	June 6	July 7	Aug. 8	Sept. 9	Oct. 10	Nov. 11	Dec. 12
Temperature (Fahrenheit)	48.9	51.8	59.2	66	73.5	79.1	81.8	81	76.6	67.3	59.1	51.7

radian mode

- a. Determine the sinusoidal regression equation. $y = 16.851 \sin(.493x - 1.925) + 65.332$
- b. Determine the period and amplitude (round to 2 decimal places)

$$\text{per} = \frac{2\pi}{B} = \frac{2\pi}{.493} = 12.741 \quad \text{amp} = |A| = 16.851$$

20. The amount of light a location on the Earth receives from the Sun changes each day depending upon the time of year and latitude of that location. The amount of daily sunshine Kansas City experiences has been recorded and is modeled by the following equation: $y = 2.8 \sin(0.02x - 1.38) + 11.97$ Determine the amount of light if it were October ($x=10$).

$$2.8 \sin(0.02(10) - 1.38) + 11.97 = 9.38 \text{ hrs}$$