

Key

Know your Unit Circle! (No calc)

1. Find the exact value of each trig function.

a) $\cos 225^\circ$

$-\frac{\sqrt{2}}{2}$

b) $\tan \frac{3\pi}{4}$

-1

c) $\csc 300^\circ$

$-\frac{2\sqrt{3}}{3}$

d) $\sin \frac{11\pi}{6}$

$-\frac{1}{2}$

e) $\cot \frac{\pi}{6}$

$\sqrt{3}$

f) $\sec 135^\circ$

$-\sqrt{2}$

$x = -4 \quad y = -3 \quad r = 5$

2. Find the reference angle for each of the following. (Units must be the same as given units)

a) -462°

78°

b) 615°

75°

c) $\frac{19\pi}{4}$

$\frac{\pi}{4}$

d) $-\frac{12\pi}{5}$

$\pi/5$

3. Find a coterminal angle (0, 360): -527° : 193° 645° : 285°

4. Find a coterminal angle [0, 2 π): $-\frac{4\pi}{13}$: $\frac{22\pi}{13}$ $\frac{32\pi}{7}$: $\frac{4\pi}{7}$

5. Convert 25° to radians: $\frac{5\pi}{36}$

6. Convert $-\frac{4\pi}{5}$ radians to degrees: -144°

7. Find the values of the six trig functions of an angle in standard position if (-6, 4) lies on its terminal side.

$\sin \theta = \frac{2}{13} = \frac{2\sqrt{13}}{13}$

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

$\tan \theta = \frac{4}{-6} = \frac{2}{-3}$

$\csc \theta = \frac{13}{2}$

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

$\cot \theta = \frac{-3}{2}$

$x = -6$
 $y = 4$

$r = \sqrt{52} = 2\sqrt{13}$

8. Find the values of the other five trig functions of an angle in standard position if $\sin \theta = -\frac{3}{5}$ in Quadrant III.

$\cos \theta = \frac{-4}{5}$

$\tan \theta = \frac{3}{4}$

$\csc \theta = \frac{-5}{3}$

$\sec \theta = \frac{-5}{4}$

$\cot \theta = \frac{4}{3}$

For #9-12 leave your answers in π form. Include units.

9. Find the radian measure of a central angle that has an arc length of $\frac{2\pi}{3}$ and a radius of 10cm.

$\frac{2\pi}{3} = (10)\theta \quad \theta = \frac{2\pi}{15} \text{ radians}$

10. Find the area of a sector of a circle that has radius 8in and a central angle of 90° .

$A = \frac{1}{2} (\pi/2) (8)^2 = 16\pi \text{ in}^2$

11. Find the length of an intercepted arc whose central angle is 135° with a radius of 15ft.

$L = (15) (135 \cdot \frac{\pi}{180}) = 15 (\frac{3\pi}{4}) = \frac{45\pi}{4} \text{ ft}$

12. Find the area of a sector of a circle that has a radius of 5cm and a central angle of $\frac{\pi}{3}$.

$A = \frac{1}{2} (4\pi/3) (5)^2 = \frac{50\pi}{3} \text{ cm}^2$

For #13 and #14 identify the amplitude, the vertical shift, the b-value, and the period for each function. Then on a separate sheet of graph paper, graph one cycle of the function over one period. Be sure to label your x-axis with the correct tick marks.

13. $y = 3 \sin 2\theta + 1$

Amplitude: 3

Vertical Shift: 1 up

b-value: 2

Period: π

14. $y = -2 \cos \frac{1}{2}\theta$

Amplitude: 2

Vertical Shift: None

b-value: 1/2

Period: 4π

15. The function $y = 45 \sin\left(\frac{\pi}{6}t\right) + 55$, where t is in months $t = 0$ represents April 15, models the yearly high temperatures (in degree) of a small Midwestern town.

a) Find the period of function. $\frac{2\pi}{\pi/6} = 12 \text{ months}$

b) What does the period represent? Every 12 months the temp. repeat.

c) Find the maximum high temperature.

$$100 \rightarrow (45 + 55)$$

d) After how many months does the maximum temperature occur?

3 months

e) Find the minimum high temperature.

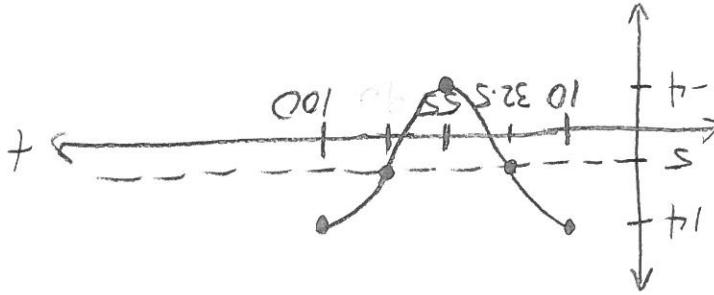
$$10 \rightarrow (55 - 45)$$

f) After how many months does the minimum temperature occur?

9 months

16. A paddle wheel has a broken plank. The height of the plank above the surface of the water forms a sinusoidal function with respect to time. The wheel has a diameter of 18 feet and makes one rotation every 90 seconds. The highest point of the wheel is 14 feet above the surface of the water. From the time you start watching, the broken plank is first at its highest point after 10 seconds.

a) Sketch the sinusoidal curve representing this situation.



b) Find the amplitude, period, and vertical shift.

$$y = 9 \cos \frac{\pi}{45} (t - 10) + 5$$

$$y = 9 \sin \frac{\pi}{45} (t - 32.5) + 5$$

c) Determine both a sine and cosine equation for this curve.

d) How far above the water's surface was the plank when you first started watching?

11.89 ft

Use $t = 0$ & substitute into formula in (c)