

• KEY.

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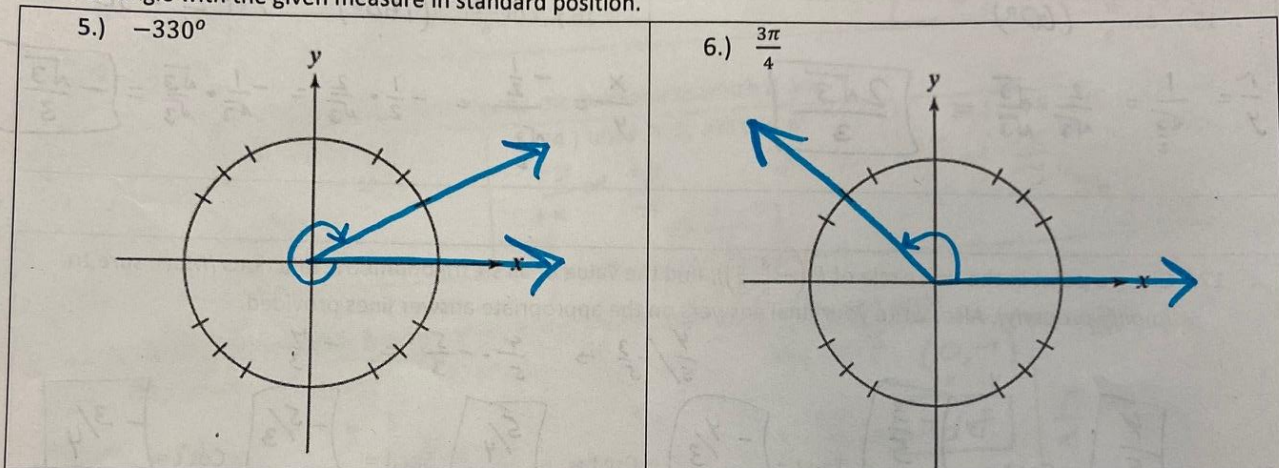
Per: _____

UNIT Review (4.1+4.2) – Trig. Basics/Unit Circle Intro. and Trig. Functions of Any Angle

Convert each degree measure into radians and each radian measure into degrees.

1.) -60° $-\frac{\pi}{3}$	2.) $-\frac{7\pi}{4}$ -315°	3.) $\frac{5\pi}{12}$ 75°	4.) 585° $\frac{13\pi}{4}$
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Draw an angle with the given measure in standard position.



Find a positive **and** a negative co-terminal angle for each given angle. (If the problem is in radians, your answers should also be in radians).

7.) 190° $-360 \rightarrow +360$ -170° 550°	8.) $\frac{4\pi}{5} \pm \frac{10\pi}{5}$ $\frac{14\pi}{5}$ $-\frac{6\pi}{5}$
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9.) Find the arc length given a radius of 15 feet and a central angle of 240° . (Express your answer in terms of π and then rounded to two decimal places).

$$S = (15 \times \frac{4\pi}{3}) = 20\pi \text{ ft.}$$

$$\approx 62.83 \text{ ft.}$$

10.) The minute hand of a clock is 6 inches long. How far does the tip of the minute hand move after 5 hours has passed? (Express your answer in terms of π and then rounded to two decimal places).

$$S = (6 \times 10\pi) = 60\pi \text{ in.}$$

$$\approx 188.50 \text{ in.}$$

11.) A large gear has a radius of 2 feet. The gear is rotating at 100 revolutions per minute. Find the linear speed, in feet per minute, of a point on the edge of the gear. (Express your answer in terms of pi and then rounded to two decimal places.)

$$\omega = \frac{100 \text{ revs.}}{1 \text{ min}} \cdot \frac{2\pi}{1 \text{ rev}} = 200\pi / \text{min.}$$

$$V = (2)(200\pi)$$

$$V = 400\pi \text{ ft./min} \approx 1256.64 \text{ ft./min}$$

Use the Unit Circle and (x, y) coordinates to find the exact values of each (Make sure to simplify properly).

12.) $\cos \frac{3\pi}{2}$ (0, -1)
270° x y
 $\frac{x}{r} = \frac{0}{1} = 0$

13.) $\sec \frac{\pi}{3}$ (60°)
 $\frac{r}{x} = \frac{1}{\frac{1}{2}} = 2$

14.) $\tan 2\pi$ (1, 0)
360° x y
 $\frac{y}{x} = \frac{0}{1} = 0$

15.) $\csc \frac{\pi}{3}$ (60°)
 $\frac{r}{y} = \frac{1}{\frac{\sqrt{3}}{2}} = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

16.) $\cot \frac{5\pi}{6}$ (150°) ref L = 30°
 $\frac{x}{y} = \frac{-\frac{1}{2}}{\frac{\sqrt{3}}{2}} = -\frac{1}{2} \cdot \frac{2}{\sqrt{3}} = -\frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = -\frac{\sqrt{3}}{3}$

17.) Given a point in the unit circle of $P(-\frac{3}{5}, \frac{4}{5})$, find the value of all six trigonometric functions (Make sure to simplify properly). Also, write your final answers on the appropriate answer lines provided.

$$\frac{4}{5} / -\frac{3}{5} \rightarrow \frac{4}{5} \cdot -\frac{5}{3} = -\frac{4}{3}$$

Sin t = $\frac{4}{5}$ Cos t = $-\frac{3}{5}$ Tan t = $-\frac{4}{3}$ Csc t = $\frac{5}{4}$ Sec t = $-\frac{5}{3}$ Cot t = $-\frac{3}{4}$

18.) The minute hand of a clock is 17 inches long. How far does the tip of the minute hand move after 3 hours and 50 minutes has passed? (Express your answer in terms of pi and then rounded to two decimal places).

3 hours = 1080°
50 min = 300°
1380° · $\frac{\pi}{180}$ = $\frac{23\pi}{3}$

$$S = (17) \left(\frac{23\pi}{3} \right)$$

$$S = \frac{391\pi}{3} \text{ in.}$$

$$\approx 409.45 \text{ in.}$$

19.) A Ferris wheel does one full rotation in 5 minutes. The radius of the wheel is 90 feet. Find the linear speed, in feet per second of a point on the outside of the Ferris wheel. (Express your answer in terms of pi and then rounded to two decimal places).

$$\omega = \frac{1 \text{ rev}}{5 \text{ min}} \cdot \frac{2\pi}{1 \text{ rev}} \cdot \frac{1 \text{ min}}{60 \text{ sec}} = \frac{2\pi}{1500} \text{ /sec.}$$

$$V = (90 \text{ ft.}) \left(\frac{\pi}{1500} \text{ /sec.} \right) = \frac{3\pi}{5} \text{ ft./sec.}$$

$$\approx 1.88 \text{ ft./sec.}$$

4.2:

Find the reference angle. Also, state what quadrant this angle terminates in.

20.) 240°

60°

21.) $585^\circ - 360^\circ = 225^\circ$

45°

Given a point on the terminal side of angle θ . Find the ratio value of each of the six trigonometric values of θ .

22.) $(-5, 2)$
x y

$(-5)^2 + (2)^2 = r^2$
 $25 + 4 = r^2$
 $29 = r^2$ $r = \sqrt{29}$

$\sin \theta = \frac{2\sqrt{29}}{29}$ $\csc \theta = \frac{\sqrt{29}}{2}$
 $\cos \theta = -\frac{5\sqrt{29}}{29}$ $\sec \theta = -\frac{\sqrt{29}}{5}$
 $\tan \theta = -\frac{2}{5}$ $\cot \theta = -\frac{5}{2}$

Let θ be an angle in standard position. Name the quadrant in which θ lies.

23.) $\sin \theta < 0, \cos \theta > 0$
-y +x

IV

24.) $\tan \theta < 0, \sin \theta < 0$
 $\frac{-y}{+x}$ or $\frac{+y}{-x}$ -y

IV

25.) $\cot \theta > 0, \sec \theta < 0$
 $\frac{+x}{+y}$ or $\frac{-x}{-y}$ -x

III

Evaluate the trigonometric function at each quadrantal angle given in the unit circle.

26.) $\cos \pi$ $(-1, 0)$
x y

$\frac{x}{r} = \frac{-1}{1} = -1$

27.) $\cot \frac{\pi}{2}$ $(0, 1)$
x y

$\frac{x}{y} = \frac{0}{1} = 0$

28.) $\tan \frac{3\pi}{2}$ $(0, -1)$
x y

$\frac{y}{x} = \frac{-1}{0} = \text{undef.}$

29.) $\sec 0$ $(1, 0)$
x y

$\frac{r}{x} = \frac{1}{1} = 1$

Find the exact value of each of the remaining trigonometric functions of θ given the information provided.

30.) $\sin \theta = -\frac{12}{13}$, θ in quadrant III

$x^2 + (-12)^2 = 13^2$, $x^2 = 25$
 $x^2 + 144 = 169$, $x = 5$

$\sin \theta = -\frac{12}{13}$

$\csc \theta = -\frac{13}{12}$

$\cos \theta = -\frac{5}{13}$

$\sec \theta = -\frac{13}{5}$

$\tan \theta = \frac{12}{5}$

$\cot \theta = \frac{5}{12}$

31.) $\cos \theta = \frac{4}{5}$, $\sin \theta < 0$

$x = 4, y = -3, r = 5$

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

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

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

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

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

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

→ Q. II

32.) $\csc \theta = \frac{5}{2}, \tan \theta < 0$

$x = -\sqrt{21}, y = 2, r = 5$

$x^2 + 2^2 = 5^2$

$x^2 = 21, x = -\sqrt{21}$

$\sin \theta = \frac{2}{5}$

$\csc \theta = \frac{5}{2}$

$\cos \theta = -\frac{\sqrt{21}}{5}$

$\sec \theta = -\frac{5\sqrt{21}}{21}$

$\tan \theta = -\frac{2\sqrt{21}}{21}$

$\cot \theta = -\frac{\sqrt{21}}{2}$

→ Q. III

33.) $\sec \theta = -10, \cot \theta > 0$

$x = -1, y = -3\sqrt{11}, r = 10$

$(-1)^2 + y^2 = 10^2$

$y^2 = 99, y = \sqrt{99}, y = 3\sqrt{11}$

$\sin \theta = -\frac{3\sqrt{11}}{10}$

$\csc \theta = -\frac{10\sqrt{11}}{33}$

$\cos \theta = -\frac{1}{10}$

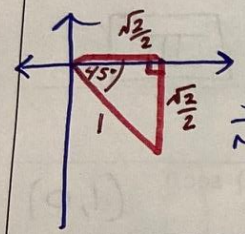
$\sec \theta = -10$

$\tan \theta = 3\sqrt{11}$

$\cot \theta = \frac{\sqrt{11}}{33}$

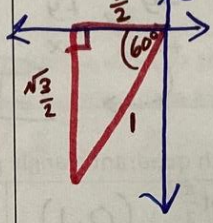
Use reference angles and 45-45-90 / 30-60-90 triangle relationships to find the exact value of each in the unit circle.

34.) $\sin \frac{7\pi}{4}$ Quad. IV (+x, -y)



$\frac{y}{r} = \frac{-\sqrt{2}}{2} = \frac{-\sqrt{2}}{2}$

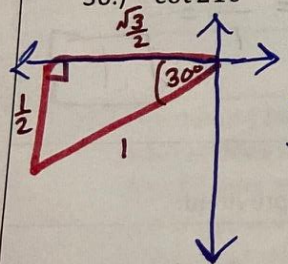
35.) $\cos 960^\circ - 360^\circ - 360^\circ = 240^\circ$



$\frac{x}{r} = \frac{-1/2}{1} = -\frac{1}{2}$

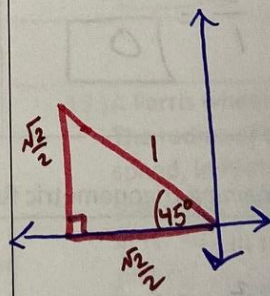
Quad. III (-x, -y)

36.) $\cot 210^\circ$ Quad. III (-x, -y)



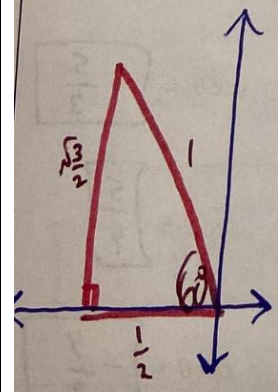
$\frac{x}{y} = \frac{-\sqrt{3}/2}{-1/2} = \frac{\sqrt{3} \cdot 2}{2 \cdot 1} = \sqrt{3}$

37.) $\sec 135^\circ$ Quad. II (-x, +y)



$\frac{r}{-x} = \frac{1}{-1/\sqrt{2}} = -\frac{2}{\sqrt{2}} \cdot \frac{\sqrt{2}}{\sqrt{2}} = -\sqrt{2}$

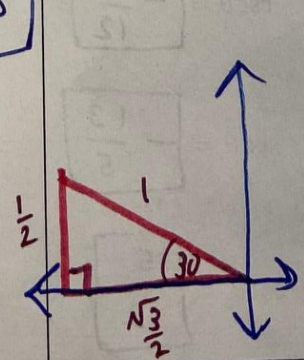
38.) $\tan \frac{2\pi}{3}$ Quad. II (-x, +y)



$\frac{y}{-x} = \frac{\sqrt{3}/2}{-1/2} = -\sqrt{3}$

39.) $\csc -\frac{19\pi}{6} + \frac{12\pi}{6} + \frac{12\pi}{6} = \frac{5\pi}{6}$

Quad II (-x, +y)



$\frac{r}{y} = \frac{1}{1/2} = 2$

