***AAT (IC/HW)-Day 1** Name Key

Chapter 6: 6-4 Values of the Trigonometric Functions Date: _____ Period: _____

Find the reference angle θ_R if θ has the given measure.

1. (a) 240° $240-180=60°$ (b) 340° $360-340=20°$ (c) -202° $202-180°=22°$ (d) -660° $360-300=60°$ $-660+360=-300$

2. (a) $3\pi/4$ $\pi-\frac{3\pi}{4}=\frac{\pi}{4}$ (b) $4\pi/3$ $\frac{4\pi}{3}-\pi=\frac{\pi}{3}$ (c) $-\pi/6$ $-\frac{\pi}{6}$ $=\frac{\pi}{6}$ (d) $9\pi/4$ $\frac{9\pi}{4}-2\pi=\frac{\pi}{4}$

3. (a) 3 $\frac{\pi}{2}<3<\pi$ $\pi-3=.14$ (b) -2 $3.14-2=1.14$ (c) 5.5 $\frac{3\pi}{2}<5.5<2\pi$ $6.28-5.50=.78$ (d) 100 $\frac{100}{2\pi}=15.92$ rev. $100-15(2\pi)$ $100-30\pi=5.75$ $2\pi-5.75=.53$

Find the exact value.

4. (a) sin $(2\pi/3)$ $\frac{\sqrt{3}}{2}$ (b) sin $(-5\pi/4)$ $\frac{\sqrt{2}}{2}$

5. (a) cos 150° $-\frac{\sqrt{3}}{2}$ (b) cos (-60°) $\frac{1}{2}$

6. (a) tan $(5\pi/6)$ $-\frac{\sqrt{3}}{3}$ (b) tan $(-\pi/3)$ $-\sqrt{3}$

7. (a) cot 120° $-\frac{\sqrt{3}}{3}$ (b) cot (-150°) $\sqrt{3}$

8. (a) sec $(2\pi/3)$ -2 (b) sec $(-\pi/6)$ $\frac{2}{\sqrt{3}}$

9. (a) csc 240° $\frac{-2}{\sqrt{3}}$ (b) csc (-330°) 2

Approximate to three decimal places.

10. (a) sin 73°20' .958 (b) cos 0.68 (radian mode) .778

11. (a) tan 21°10' .387 (b) cot 1.13 radian $1/\tan(1.13)$ .472

12. (a) sec 67°50' $1/\cos(67°50')$ 2.650 (b) csc 0.32 (radian) $1/\sin .32$ 3.179

13. (a) csc 43°40' $\frac{1}{\sin 43°40'}=$ 1.448 (b) sec 0.26 radian $1/\cos .26$ 1.035

Approximate the acute angle θ to the nearest (a) 0.01° and (b) 1'.

14. cos θ = 0.8620

$\cos^{-1}(.8620)$

(a) 30.46°

(b) 30°27'

15. tan θ = 3.7

$\tan^{-1}(3.7)$

(a) 74.88°

(b) 74°53'

16. sin θ = 0.4217

$\sin^{-1}(.4217)$

(a) 24.94°

(b) 24°57'

17. sec θ = 4.246

$\cos\theta = \frac{1}{4.246}$

$\theta = \cos^{-1}\left(\frac{1}{4.246}\right)$

(a) 76.38°

(b) 76°23'

Approximate to four decimal places.

18. (a) sin 98°10' (b) cos 623.7° (c) tan 3 (d) cot 231°40' (e) sec 1175.1° (f) csc 0.82

(radian) (1/tan 231°40')

(1/cos 1175.1) (radian) (1/sin .82)

≈ 0.9899 ≈ -0.1097 ≈ -0.1425 ≈ 0.7907 ≈ -11.2493 ≈ 1.3677

Approximate, to the nearest 0.1°, all angles θ in the interval [0°, 360°) that satisfy the equation.

19. (a) sin θ = -0.5640

$\sin^{-1}(-0.5640) \approx -34.3°$

$\theta_R = 34.3$ (sin neg in QIII + QIV)

180 + 34.3 = 214.3°

360 − 34.3 = 325.7°

(b) cos θ = 0.7490

$\cos^{-1}(.7490) = 41.5°$

$\theta_R = 41.5°$

QI: 41.5°

QIV: 360 − 41.5 = 318.5°

(c) tan θ = 2.798

$\tan^{-1}(2.798) = 70.3°$

$\theta_R = 70.3°$

QI: 70.3°

QIII: 180 + 70.3 = 250.3°

(d) cot θ = -0.9601

$\tan\theta = \frac{1}{-.9601}$; $\theta = \tan^{-1}\left(\frac{-1}{.9601}\right)$

$\theta_R = 46.2°$ ≈ -46.2°

QII: 180 − 46.2 = 133.8°

QIV: 360 − 46.2 = 313.8°

(e) sec θ = -1.116

$\cos\theta = \frac{1}{-1.116}$; $\theta = \cos^{-1}\left(\frac{-1}{1.116}\right)$

θ = 153.6°

$\theta_R = 180 - 153.6 = 26.4°$

QII: 153.6°

QIII: 180 + 26.4 = 206.4°

(f) csc θ = 1.485

$\sin\theta = \frac{1}{1.485}$;

$\theta = \sin^{-1}\left(\frac{1}{1.485}\right) = 42.3°$

$\theta_R = 42.3°$

QI: 42.3°

QII: 180 − 42.3 = 137.7°

Approximate, to the nearest 0.01 radian, all angles θ in the interval [0, 2π) that satisfy the equation.

20. (a) sin θ = 0.4195

$\sin^{-1}(.4195) \approx .43$; $\theta_R = .43$

QI: .43

QII: π − .43 ≈ 2.71

(b) cos θ = -0.1207

$\cos^{-1}(-.1207) \approx 1.69$

$\theta_R = \pi - 1.69 \approx 1.45$

QII: 1.69

QIII: π + 1.45 ≈ 4.59

(c) tan θ = -3.2504

$\tan^{-1}(-3.2504) \approx -1.27$

$\theta_R = 1.27$

QII: π − 1.27 ≈ 1.87

QIV: 2π − 1.27 ≈ 5.01

(d) $\cot\theta = 2.6815$

$\tan\theta = \frac{1}{2.6815}$;

$\theta = \tan^{-1}\left(\frac{1}{2.6815}\right) \approx .36$

$\theta_R = .36$

Q1: .36

Q III: $\pi + .36 \approx 3.50$

(e) $\sec\theta = 1.7452$

$\cos\theta = \frac{1}{1.7452}$;

$\theta = \cos^{-1}\left(\frac{1}{1.7452}\right) \approx .96$

$\theta_R = .96$

Q1: .96

Q IV: $2\pi - .96 \approx 5.32$

(f) $\csc\theta = -4.8521$

$\sin\theta = \frac{1}{-4.8521}$

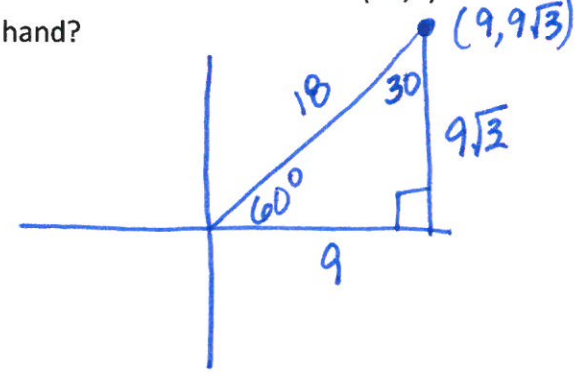
$\theta = \sin^{-1}\left(-\frac{1}{4.8521}\right) \approx -.21$

$\theta_R = .21$

Q III: $\pi + .21 \approx 3.35$

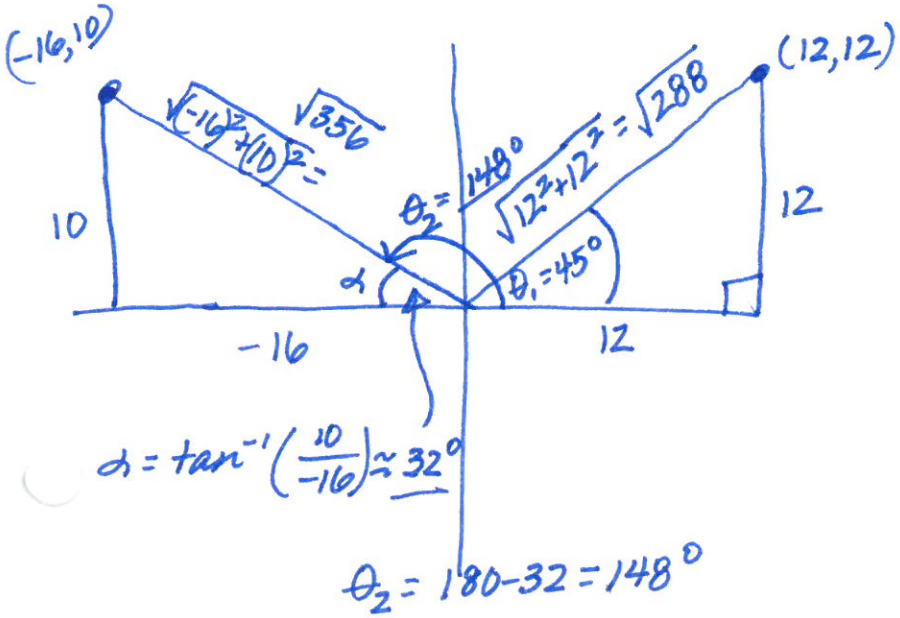
Q IV: $2\pi - .21 \approx 6.07$

21. Suppose a robot has a straight arm 18 inches long that can rotate about the origin in a coordinate plane. If the robot's hand is located at (18,0) and then rotates through an angle of 60°, what is the new location of the hand?



$(9, 9\sqrt{3})$

22. Suppose the robots arm in #21 can change its length in addition to rotating about the origin. If the hand is initially at (12, 12), approximately how many degrees should the arm be rotated and how much should its length be changed to move the hand to (-16, 10)?



$\alpha = \tan^{-1}\left(\frac{10}{-16}\right) \approx 32°$

$\theta_2 = 180 - 32 = 148°$

rotate $\theta_2 - \theta_1 = 148 - 45$

$= 103°$ CCW

increase length =

$\sqrt{356} - \sqrt{288} \approx 1.9$ in