Precalculus Worksheet **Name** _____

Section 4.7 – Inverse Trig Functions **Period** _____

Evaluate the given expression without the aid of a calculator.

1. $\sin^{-1}\left(\frac{1}{2}\right)$

$30°, \frac{\pi}{6}$

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

$60°, \frac{\pi}{3}$

3. $\tan^{-1}\left(\frac{\sqrt{3}}{3}\right)$

$\frac{\frac{1}{2}y}{\frac{\sqrt{3}}{2}x} \rightarrow \left(\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

$30°, \frac{\pi}{6}$

4. $\arccos\left(\frac{\sqrt{3}}{2}\right)$

$30°, \frac{\pi}{6}$

5. $\arcsin\left(\frac{\sqrt{2}}{2}\right)$

$45°, \frac{\pi}{4}$

6. $\arctan(1)$

$45°, \frac{\pi}{4}$

7. $\arcsin\left(-\frac{1}{2}\right)$

$-30°, -\frac{\pi}{6}$

8. $\arccos\left(-\frac{1}{2}\right)$

$120°, \frac{2\pi}{3}$

9. $\arctan\left(-\frac{\sqrt{3}}{3}\right)$

$-30°, -\frac{\pi}{6}$

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

$150°, \frac{5\pi}{6}$

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

$-45°, -\frac{\pi}{4}$

12. $\tan^{-1}(-1)$

$-45°, -\frac{\pi}{4}$

13. $\sin^{-1} 0$

$0°, 0$

14. $\cos^{-1} 0$

$\frac{1}{1}$ $(\cancel{1, 0})$

$\cancel{0°, 0}$ $90°, \frac{\pi}{2}$

15. $\tan^{-1}(-\sqrt{3})$

$\left(\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$ $\frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}}$

$-60°, -\frac{\pi}{3}$

16. $\arcsin(1)$

$90°, \frac{\pi}{2}$

17. $\arccos(1)$

$0°, 0$

18. $\tan^{-1} 0$

$0°, 0$

19. $\arcsin(-1)$

$-90°, -\frac{\pi}{2}$

20. $\arccos(-1)$

$180°, \pi$

Find the exact value without a calculator. COMPOSITION FUNCTIONS

21. $\cos\left(\boxed{\sin^{-1}\left(\frac{1}{2}\right)}\right)$

$\cos(30^\circ)$

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

22. $\sin\left(\cos^{-1}\left(\frac{\sqrt{2}}{2}\right)\right)$

$\sin(45^\circ)$

$\boxed{\frac{\sqrt{2}}{2}}$

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

$\sin^{-1}\left(\frac{1}{2}\right)$

$\boxed{30^\circ}$

24. $\cos^{-1}\left(\sin\left(\frac{\pi}{6}\right)\right)$

$\cos^{-1}\left(\frac{1}{2}\right)$

$\boxed{60^\circ}$

25. $\sin^{-1}\left(\sin\left(\frac{7\pi}{4}\right)\right)$

$\sin^{-1}\left(-\frac{\sqrt{2}}{2}\right)$

$\boxed{-45^\circ}$

26. $\arccos\left(\sin\left(\frac{\pi}{3}\right)\right)$

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

$\boxed{30^\circ}$

27. $\sin\left(\tan^{-1}\left(\sqrt{3}\right)\right)$

$\sin(60^\circ)$

stop here

~~60°~~

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

$\frac{1}{2}$

OR

$\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

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

28. $\cos\left(\tan^{-1}(-1)\right)$

$\cos(-45^\circ)$

$\boxed{\frac{\sqrt{2}}{2}}$

29. $\tan^{-1}(\cos(\pi))$

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

$\boxed{-45^\circ}$

Find an algebraic expression equivalent to the given expression.

30. $\tan\left(\arccos\left(\frac{x}{3}\right)\right)$

31. $\sin(\arccos(x))$

32. $\sin\left(\arctan\left(\frac{x}{2}\right)\right)$

Evaluate using your calculator to find the approximate value. Express your answer in degrees.

33. $\sin^{-1}(.8621)$

34. $\tan^{-1}(.5893)$

35. $\cos^{-1}(-.3218)$

36. arcsin (-.6821)

37. arctan (-1.6283)

38. arcos(.2814)

Evaluate using your calculator to find the approximate value. Express your answer in radians

39. arcsin (.2618)

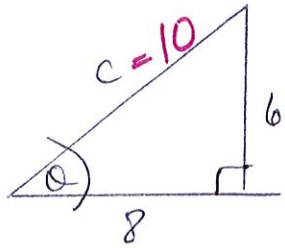
40. $\cos^{-1}(-.8090)$

41. $\tan^{-1}(-1.7321)$

Section: Assume all values positive

Right Triangle Trig Day 1

1. $\tan\theta = \frac{6}{8}$; find $\sin\theta$



Remember, $\tan\theta = \frac{\text{opposite}}{\text{adjacent}}$

- Label a Δ with an acute angle, θ
- Use Pythagorean Thm to find missing side measure

$$8^2 + 6^2 = c^2$$
$$64 + 36 = c^2$$
$$100 = c^2$$
$$10 = c$$

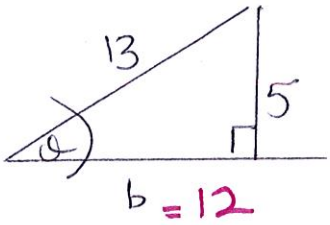
(we take only the positive square root as geometric measures cannot be negative.)

Now use found measure to write $\sin\theta$

$$\sin\theta = \frac{\text{opposite}}{\text{hypotenuse}} = \frac{6}{10} = \boxed{\frac{3}{5}}$$

simplify, always

2. $\sin\theta = \frac{5}{13}$; find $\sec\theta$



$$\sin\theta = \frac{\text{opp}}{\text{hyp}}$$

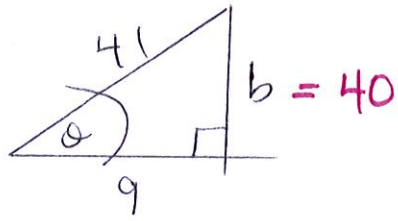
$$5^2 + b^2 = 13^2$$
$$25 + b^2 = 169$$
$$b^2 = 144$$
$$b = 12 = 12$$

Recall that secant is the reciprocal of cos

$$\therefore \sec = \frac{1}{\cos} = \frac{\text{hyp}}{\text{adj}}$$

$$\boxed{\sec\theta = \frac{13}{12}}$$

3. $\cos\theta = \frac{9}{41}$; find $\cot\theta$



$9^2 + b^2 = 41^2$

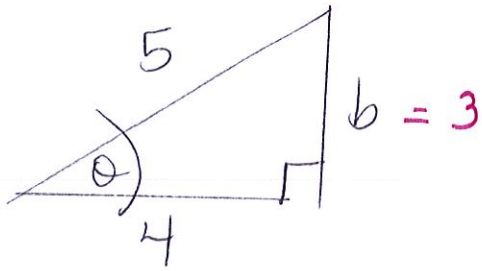
$81 + b^2 = 1681$

$b^2 = 1600$

$b = 40$

$\cot\theta = \frac{1}{\tan\theta} = \frac{adj}{opp} = \boxed{\frac{9}{40}}$

4. $\sec\theta = \frac{5}{4}$; find $\sin\theta$



$\sec\theta = \frac{1}{\cos\theta} = \frac{hyp}{adj}$

$4^2 + b^2 = 5^2$

$16 + b^2 = 25$

$b^2 = 9$

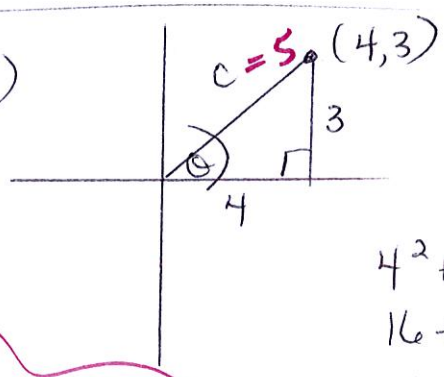
$b = 3$

$\sin\theta = \frac{opp}{hyp} = \boxed{\frac{3}{5}}$

Section 2

Use "Always Study Trig" Carefully to determine signs of trig functions

5. $(4, 3)$



$4^2 + 3^2 = c^2$

$16 + 9 = c^2$

$25 = c^2$

$5 = c$

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

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

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

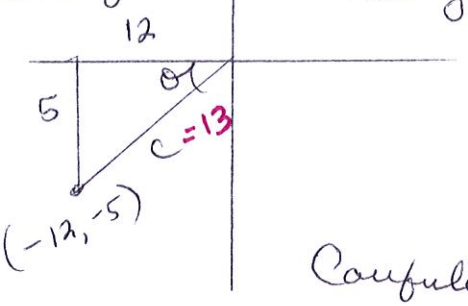
$\sec\theta = \frac{5}{4}$

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

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

Study Always

6. $(-12,-5)$



$12^2+5^2=c^2$

$144+25=c^2$

$169=c^2$

$13=c$

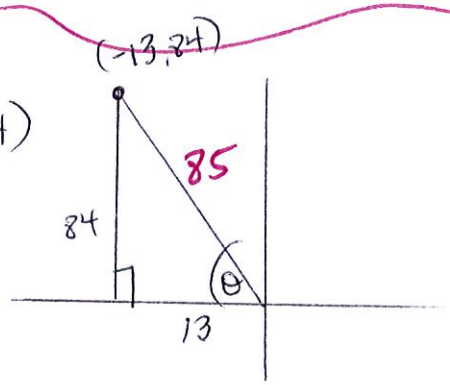
Trig Carefully

only tan + cot are positive in Q3

$\sin\theta = \frac{-5}{13}$ $\cos\theta = \frac{-12}{13}$ $\tan\theta = \frac{5}{12}$

$\csc\theta = \frac{-13}{5}$ $\sec\theta = \frac{-13}{12}$ $\cot\theta = \frac{12}{5}$

7. $(-13,84)$



$13^2+84^2=c^2$

$169+7056=c^2$

$7225=c^2$

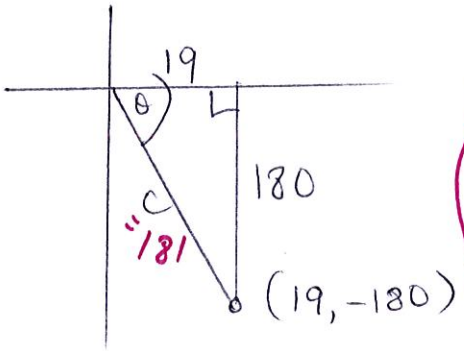
$85=c$

sin + csc are positive in Q2

$\sin\theta = \frac{84}{85}$ $\cos\theta = \frac{-13}{85}$ $\tan\theta = \frac{-84}{13}$

$\csc\theta = \frac{85}{84}$ $\sec\theta = \frac{-85}{13}$ $\cot\theta = \frac{-13}{84}$

8. $(19,-180)$



$19^2+180^2=c^2$

$361+32,400=c^2$

$32,761=c^2$

$181=c$

↑ Cos + sec are positive in Q4

$\sin\theta = \frac{-180}{181}$ $\csc\theta = \frac{-181}{180}$

$\cos\theta = \frac{19}{181}$ $\sec\theta = \frac{181}{19}$

$\tan\theta = \frac{-180}{19}$ $\cot\theta = \frac{-19}{180}$

Right Triangle Trig

Day 1 Practice # 1-8

1. $\tan\theta = 5/8$, find $\sin\theta$

2. $\sin\theta = \frac{5}{13}$, find $\sec\theta$

3. $\cos\theta = \frac{9}{41}$, find $\cot\theta$

4. $\sec\theta = \frac{5}{4}$, find $\sin\theta$

In Exercises 5-8, the point given is on the terminal side of an angle in standard position. Determine the exact values of the six trigonometric functions of the angle.

5. (4,3)

6. (-12, -5)

7. $(-3, 8.4)$

8. (19, -180)

In Exercises 9-12, state the quadrant in which θ lies.

9. $\sin\theta < 0$ and $\cos\theta < 0$
10. $\sin\theta > 0$ and $\cos\theta > 0$
11. $\sin\theta > 0$ and $\tan\theta < 0$
12. $\sec\theta > 0$ and $\cot\theta < 0$

Start here

In Exercises 13-18, find the values of the six trigonometric functions of θ.

13. $\sin\theta = \frac{11}{61}$, constraint: θ lies in quadrant II.

14. $\cos\theta = -\frac{4}{5}$, constraint: θ lies in quadrant III.

15. $\tan\theta = -\frac{15}{8}$, constraint: $\sin\theta < 0$.

16. $\cos\theta = \frac{8}{17}$, constraint: $\tan\theta < 0$.

17. $\cot\theta = -3$, constraint: $\cos\theta > 0$.

18. $\csc\theta = 4$, constraint: $\cot\theta < 0$.