

CALCULATORS NOT ALLOWED

Find answers in both radians and degrees for # 1 - 17

1. $\tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ radians $\frac{\pi}{6}$ Degrees 30°

2. $\cos^{-1}(-1)$ radians π Degrees 180°
 $(-1, 0) \rightarrow$

3. $\tan^{-1}(\sqrt{3})$ radians $\frac{\pi}{3}$ Degrees 60°

4. $\sin^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ radians $-\frac{\pi}{3}$ Degrees -60°

5. $\tan^{-1}(-1)$ radians $-\frac{\pi}{4}$ Degrees -45°

6. $\cos^{-1}(0)$ radians $\frac{\pi}{2}$ Degrees 90°
 $(0, 1) \rightarrow$

7. $\sin^{-1}\left(\frac{\sqrt{3}}{2}\right)$ radians $\frac{\pi}{3}$ Degrees 60°

8. $\cos^{-1}\left(-\frac{1}{2}\right)$ radians $\frac{2\pi}{3}$ Degrees 120°

9. $\cos^{-1}\left(-\frac{\sqrt{3}}{2}\right)$ radians $\frac{5\pi}{6}$ Degrees 150°

10. $\tan^{-1}(0)$ radians 0 Degrees 0°

11. $\tan^{-1}\left(\tan\frac{3\pi}{4}\right)$ radians $-\frac{\pi}{4}$ Degrees -45°

12. $\tan^{-1}\left(\tan\frac{\pi}{3}\right)$ radians $\frac{\pi}{3}$ Degrees 60°

13. $\sin^{-1}\left(\cot\frac{\pi}{2}\right)$ radians 0 Degrees 0°

14. $\cos^{-1}\left(\sin\frac{3\pi}{2}\right)$ radians π Degrees 180°

15. $\cos^{-1}\left(\sin\frac{7\pi}{6}\right)$ radians $\frac{2\pi}{3}$ Degrees 120°

16. $\cos^{-1}\left(\cos\frac{7\pi}{4}\right)$ radians $\frac{\pi}{4}$ Degrees 45°

17. $\sin^{-1}\left(\sin\frac{7\pi}{6}\right)$ radians $-\frac{\pi}{6}$ Degrees -30°

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

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

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

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

22. $\cos\left(\tan^{-1}\left(-\frac{7}{3}\right)\right)$ $\frac{3\sqrt{58}}{58}$

23. $\sin\left(\tan^{-1}\left(\frac{1}{5}\right)\right)$ $\frac{\sqrt{26}}{26}$

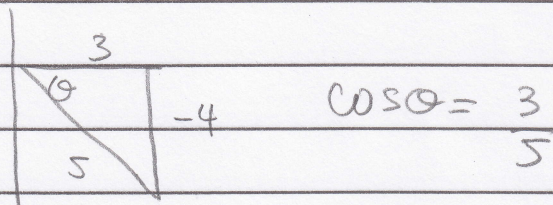
24. $\sin\left(\tan^{-1}\left(\frac{13}{9}\right)\right)$ $\frac{13\sqrt{10}}{50}$

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

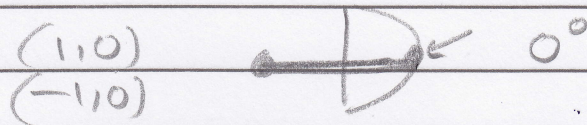
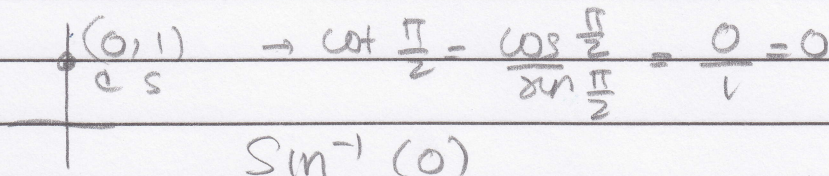
26. $\sin\left(\cos^{-1}\left(-\frac{2}{3}\right)\right)$ $\frac{\sqrt{5}}{3}$

27. $\cos\left(\tan^{-1}\left(-\frac{4}{3}\right)\right)$ $\frac{3}{5}$

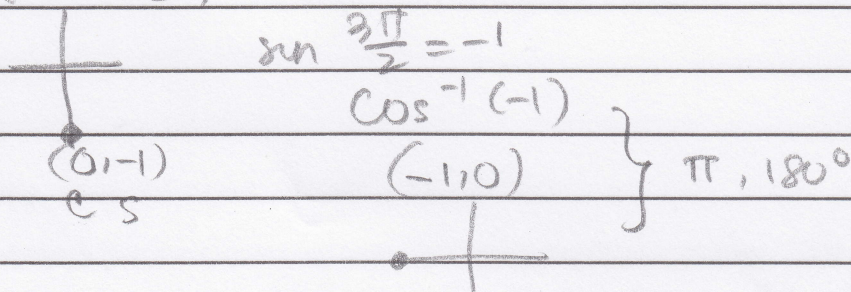
27. $\cos(\tan^{-1}(-\frac{4}{3}))$



13. $\sin^{-1}(\cot \frac{\pi}{2})$



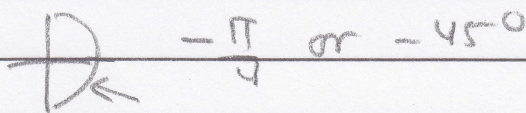
14. $\cos^{-1}(\sin \frac{3\pi}{2})$



11. $\tan^{-1}(\tan \frac{3\pi}{4})$

$\frac{3\pi}{4}$ in $Q II \rightarrow \tan \frac{3\pi}{4} = -1$

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



12. $\tan^{-1}(\tan \frac{\pi}{3})$

$\tan \frac{\pi}{3} = \sqrt{3}$

$\tan^{-1}(\sqrt{3}) = \frac{\pi}{3}$ or 60°

Q III

15. $\cos^{-1}(\sin \frac{7\pi}{6})$

$\sin \frac{7\pi}{6} = -\frac{1}{2}$

$\cos^{-1}(-\frac{1}{2}) = \frac{2\pi}{3}; 120^\circ$

↑
Q II

Q IV

16. $\cos^{-1}(\cos \frac{7\pi}{4})$

$\cos \frac{7\pi}{4} = \frac{\sqrt{2}}{2}$

$\cos^{-1}(\frac{\sqrt{2}}{2}) = \frac{\pi}{4}; 45^\circ$

Q I

Q III

17. $\sin^{-1}(\sin \frac{7\pi}{6})$

$\sin(\frac{7\pi}{6}) = -\frac{1}{2}$

$\sin^{-1}(-\frac{1}{2}) = \ominus \frac{\pi}{6}; -30^\circ$

18. $\cos(\tan^{-1}(-\frac{1}{\sqrt{3}}))$

$\tan^{-1}(-\frac{1}{\sqrt{3}}) = \ominus \frac{\pi}{6}$

$\cos(-\frac{\pi}{6}) = \cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$

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

$\tan^{-1}(\sqrt{3}) \rightarrow \text{Q I}; \frac{\pi}{3}$

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

20. $\cos(\sin^{-1}(\frac{\sqrt{3}}{2}))$

$\sin^{-1}(\frac{\sqrt{3}}{2}) = \frac{\pi}{3}$

$\cos \frac{\pi}{3} = \frac{1}{2}$

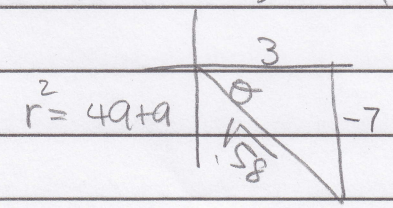
21. $\sin(\tan^{-1}(-\frac{1}{\sqrt{3}}))$

$\tan^{-1}(-\frac{1}{\sqrt{3}}) = -\frac{\pi}{6}$

$\sin(-\frac{\pi}{6}) = -\sin \frac{\pi}{6} = -\frac{1}{2}$

22. $\cos(\tan^{-1}(-\frac{7}{3}))$

$\tan^{-1}(-\frac{7}{3}) \rightarrow \text{Q IV}$



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

23. $\sin \tan^{-1}(\frac{1}{5})$

$\sin \theta = \frac{1}{\sqrt{26}} = \frac{\sqrt{26}}{26}$

25. $\cos(\sin^{-1}(\frac{1}{2}))$

$\cos \frac{\pi}{6} = \frac{\sqrt{3}}{2}$

24. $\sin(\tan^{-1}(\frac{13}{9}))$

$r^2 = 13^2 + 9^2 = 250$

$\sin \theta = \frac{13}{\sqrt{10}} = \frac{13\sqrt{10}}{10}$

26. $\sin(\cos^{-1}(-\frac{2}{3}))$

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

33. Convert to degrees: $\frac{-2\pi}{18} \cdot \frac{180^\circ}{\pi} = -20^\circ$

34. Convert to radians: $\frac{-82^\circ}{1} \cdot \frac{\pi}{180^\circ} = -\frac{41\pi}{90}$

35. A sector of a circle has arc length 25 cm and central angle of 25° . Find the radius and area.

$$25 = \frac{25^\circ}{360^\circ} \cdot 2\pi \cdot r \rightarrow 25 = \frac{50\pi r}{360}$$

$$9000 = 50\pi r \rightarrow r = \frac{9000}{50\pi} = \frac{180}{\pi} \text{ cm}$$

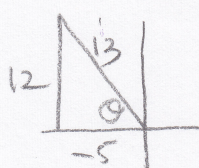
$$A = \frac{25^\circ}{360^\circ} \cdot \pi \cdot \left(\frac{180}{\pi}\right)^2 = \frac{2250}{\pi} \text{ cm}^2$$

36. A sector of a circle has radius 36 cm and central angle of $\frac{7\pi}{9}$. Find the arc length and area in terms of π

$$S = r\theta = 36 \cdot \frac{7\pi}{9} = 28\pi \text{ cm}$$

$$A = \frac{1}{2}r^2\theta = \frac{1}{2} \cdot (36)^2 \cdot \left(\frac{7\pi}{9}\right) = 504\pi \text{ cm}^2$$

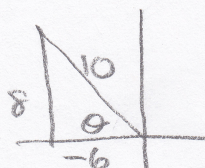
37. $\sin \theta = \frac{12}{13}; \frac{\pi}{2} < \theta < \pi$. Find $\sec \theta$



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

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

38. The point $(-6, 8)$ is on the terminal side of an angle. Find $\sec \theta$

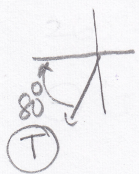


$$\cos \theta = -\frac{6}{10} = -\frac{3}{5}$$

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

Express in terms of a reference angle:

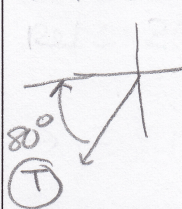
39. $\tan 260^\circ$ Q III



$$+ \tan 80^\circ$$

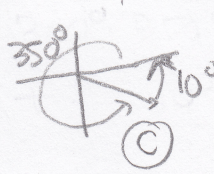
40. $\sin -100^\circ + 360^\circ$

$\sin 260^\circ$ Q III $\rightarrow \ominus$



$$- \sin 80^\circ$$

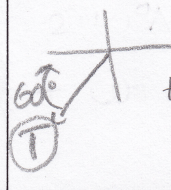
41. $\sec 350^\circ$ Q IV \oplus



$$+ \sec 10^\circ$$

42. $\cot 600^\circ - 360^\circ$

$\cot 240^\circ$ Q III \oplus



$$+ \cot 60^\circ$$

43. $\csc \theta$ and $\tan \theta$ are both negative in what quadrant?

$$\csc \theta \text{ in Q II } \neq \text{ Q IV}$$

$$\tan \theta \text{ in Q II } \neq \text{ Q IV}$$

$$\rightarrow \text{both } \theta \text{ in Q IV}$$

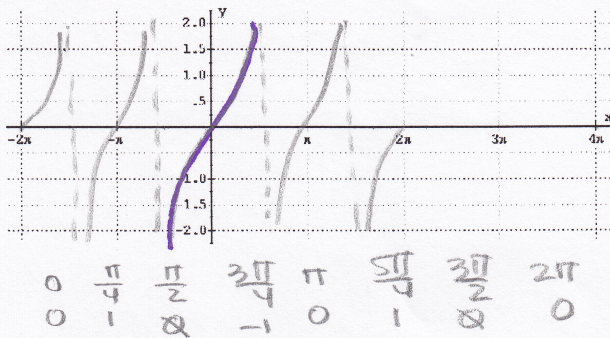
44. $\sec \theta$ and $\csc \theta$ are both negative in what quadrant?

$$\sec \theta \text{ in Q II } \neq \text{ Q III}$$

$$\csc \theta \text{ in Q II } \neq \text{ Q IV}$$

$$\text{both } \theta \text{ in Q III}$$

28 a) Graph over $-2\pi < x < 2\pi$.
 $y = \tan x$

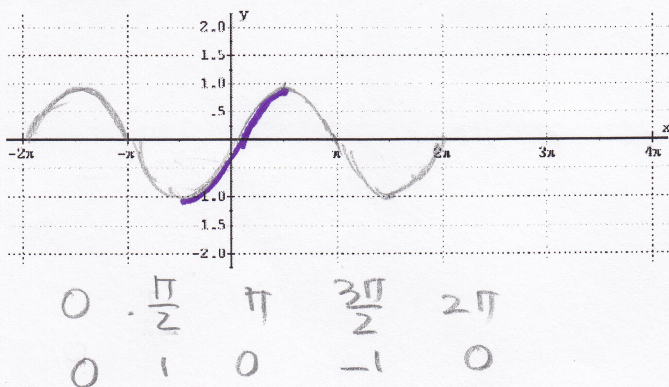


Domain: $x \neq \frac{\pi}{2} + n\pi$
 Range: all real #s
 no - not 1-1
 Does this graph have an inverse? Why or why not?
 Darken a portion of the graph that is one-to-one and thus have an inverse.
 Domain of $y = \tan x$:

$$-\frac{\pi}{2} < x < \frac{\pi}{2}$$

Graph over $-2\pi < x < 2\pi$ and then darken the portion that has an inverse.

29 $y = \sin x$



Domain: all real Range: $-1 \leq y \leq 1$

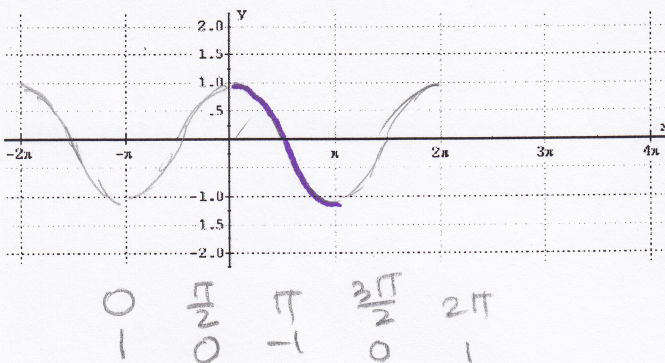
no - not 1-1

Does this graph have an inverse? Why or why not?
 Darken a portion of the graph that is one-to-one and thus have an inverse.

Domain of $y = \sin x$:

$$-\frac{\pi}{2} \leq x \leq \frac{\pi}{2}$$

30 $y = \cos x$



Domain: all real Range: $-1 \leq y \leq 1$

no - not 1-1

Does this graph have an inverse? Why or why not?
 Darken a portion of the graph that is one-to-one and thus have an inverse.

Domain of $y = \cos x$:

$$0 \leq x \leq \pi$$

31. Find one positive and one negative angles that are coterminal with 62°

$$62^\circ + 360^\circ = 422^\circ$$

$$62^\circ - 360^\circ = -298^\circ$$

32. Find one positive and one negative angles that are coterminal with $-\frac{2\pi}{9}$

$$-\frac{2\pi}{9} + \frac{2\pi}{1} \cdot \frac{1}{9} = \frac{16\pi}{9}$$


$$-\frac{2\pi}{9} - \frac{2\pi}{1} \cdot \frac{1}{9} = -\frac{20\pi}{9}$$

p289

↓ not in the domain

5

$$\sin^{-1} 0 = (1, 0) \quad (-1, 0)$$



$$(1, 0) \rightarrow 0$$

$$\cos^{-1} 0 = (0, 1) ; \textcircled{0, -1} \quad \text{umbrella} \rightarrow \frac{\pi}{2}$$

$$\tan^{-1} 1 = \frac{\pi}{4}$$

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

7

$$\sin^{-1} \frac{1}{2} = \frac{\pi}{6}$$

$$\sin^{-1} -\frac{1}{2} = -\frac{\pi}{6}$$

$$\cos^{-1} \frac{1}{2} = \frac{\pi}{3}$$

$$\cos^{-1} -\frac{1}{2} = \frac{2\pi}{3}$$

6

$$\sin^{-1} (1) \quad (0, 1) \quad \uparrow \quad \frac{\pi}{2}$$

$$\sin^{-1} (-1) \quad (0, -1) \quad \downarrow \quad -\frac{\pi}{2} \quad \text{not } \frac{3\pi}{2}$$

$$\cos^{-1} (1) \quad (1, 0) \quad \rightarrow \quad 0$$

$$\cos^{-1} (-1) \quad (-1, 0) \quad \leftarrow \quad \pi$$

8

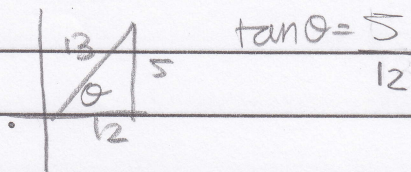
$$\sin^{-1} \frac{\sqrt{2}}{2} = \frac{\pi}{4}$$

$$\sin^{-1} -\frac{\sqrt{2}}{2} = -\frac{\pi}{4}$$

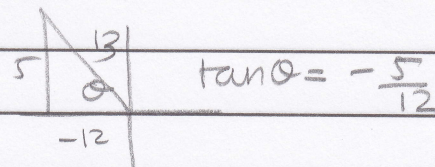
$$\cos^{-1} \frac{\sqrt{2}}{2} = \frac{\pi}{4}$$

$$\cos^{-1} -\frac{\sqrt{2}}{2} = \frac{3\pi}{4}$$

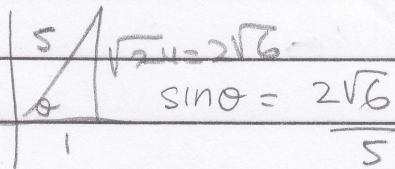
11. $\tan(\cos^{-1}(\frac{12}{13}))$



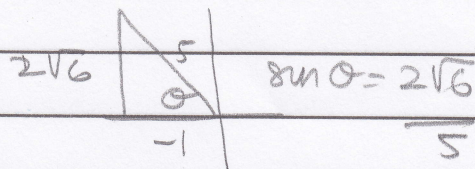
(b) $\tan(\cos^{-1}(-\frac{12}{13}))$



12. $\sin(\cos^{-1}(\frac{1}{5}))$



(b) $\sin(\cos^{-1}(-\frac{1}{5}))$



p 285

5. $\tan 820^\circ$

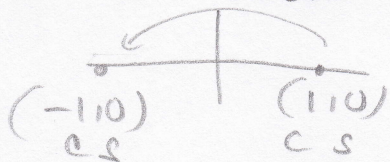
$820^\circ - 2(360^\circ) = 100^\circ \rightarrow \text{Q II} \rightarrow \tan \ominus$
 ref: $180^\circ - 100^\circ = 80^\circ$ $\rightarrow \ominus \tan 80^\circ$

b $\sec 290^\circ \rightarrow \text{Q IV} \rightarrow \sec \oplus$
 $360^\circ - 290^\circ = 70^\circ$ $\rightarrow \oplus \sec 70^\circ$

c $\csc 600^\circ \rightarrow 600^\circ - 360^\circ = 240^\circ \rightarrow \text{Q III} \rightarrow \csc \ominus$
 $240^\circ - 180^\circ = 60^\circ$ $\rightarrow \ominus \csc 60^\circ$

d $\tan 3 \rightarrow \text{Q II} \rightarrow \tan \ominus$
 $3.14 - 3 = 0.14$ $\rightarrow \ominus \tan 0.14$

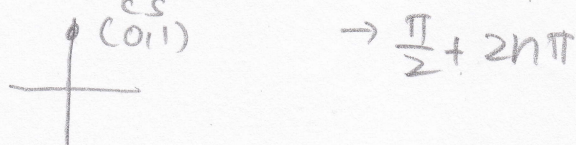
(7) $\csc x = \frac{1}{\sin x} \rightarrow$ undefined when $\sin x = 0$



$0 + n\pi$

(b) $\csc x = 0 \rightarrow \frac{1}{\sin x} = 0 \rightarrow$ not possible

(c) $\csc x = 1 \rightarrow \frac{1}{\sin x} = 1 \rightarrow \sin x = 1$



(d) $\csc x = -1$

