4.4 HW Answers

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10. $\theta = \pi$ radians
The terminal side of the angle is on the negative x-axis. Select the point $P = (-1, 0)$: $x = -1, y = 0, r = 1$
Apply the definition of the tangent function.
$\tan \pi = \frac{y}{x} = \frac{0}{-1} = 0$

12. $\theta = \pi$ radians
The terminal side of the angle is on the negative x-axis. Select the point $P = (-1, 0)$: $x = -1, y = 0, r = 1$
Apply the definition of the cosecant function.
$\csc \pi = \frac{r}{y} = \frac{1}{0}$, undefined

14. $\theta = \frac{3\pi}{2}$ radians
The terminal side of the angle is on the negative y-axis. Select the point $P = (0, -1)$: $x = 0, y = -1, r = 1$
Apply the definition of the cosine function.
$\cos \frac{3\pi}{2} = \frac{x}{r} = \frac{0}{1} = 0$

16. $\theta = \frac{\pi}{2}$ radians
The terminal side of the angle is on the positive y-axis. Select the point $P = (0, 1)$: $x = 0, y = 1, r = 1$
Apply the definition of the tangent function.
$\tan \frac{\pi}{2} = \frac{y}{x} = \frac{1}{0}$, undefined

18. Because $\sin\theta < 0$, θ cannot lie in quadrant I or quadrant II; the sine function is positive in those two quadrants. Thus, with $\sin\theta < 0$, θ lies in quadrant III or quadrant IV. We are also given that $\cos\theta > 0$. Because quadrant IV is the only quadrant in which the cosine is positive and the sine is negative, we conclude that θ lies in quadrant IV.

20. Because $\tan\theta < 0$, θ cannot lie in quadrant I or quadrant III; the tangent function is positive in those two quadrants. Thus, with $\tan\theta < 0$, θ lies in quadrant II or quadrant IV. We are also given that $\sin\theta < 0$. Because quadrant IV is the only quadrant in which the sine is negative and the tangent is negative, we conclude that θ lies in quadrant IV.

22. Because $\cot\theta > 0$, θ cannot lie in quadrant II or quadrant IV; the cotangent function is negative in those two quadrants. Thus, with $\cot\theta > 0$, θ lies in quadrant I or quadrant III. We are also given that $\sec\theta < 0$. Because quadrant III is the only quadrant in which the secant is negative and the cotangent is positive, we conclude that θ lies in quadrant III.

39. Because 355° lies between 270° and 360°, it is in quadrant IV. The reference angle is
$\theta' = 360° - 355° = 5°$.

41. Because $\frac{7\pi}{4}$ lies between $\frac{3\pi}{2} = \frac{6\pi}{4}$ and $2\pi = \frac{8\pi}{4}$, it is in quadrant IV. The reference angle is
$\theta' = 2\pi - \frac{7\pi}{4} = \frac{8\pi}{4} - \frac{7\pi}{4} = \frac{\pi}{4}$.

43. Because $\frac{5\pi}{6}$ lies between $\frac{\pi}{2} = \frac{3\pi}{6}$ and $\pi = \frac{6\pi}{6}$, it is in quadrant II. The reference angle is
$\frac{5\pi}{6} - \frac{6\pi}{6} = \frac{5\pi}{6}$ π

45. $-150° + 360° = 210°$
Because the angle is in quadrant III, the reference angle is $\theta' = 210° - 180° = 30°$.

47. $-335° + 360° = 25°$
Because the angle is in quadrant I, the reference angle is $\theta' = 25°$.

49. Because 4.7 lies between $\pi \approx 3.14$ and $\frac{3\pi}{2} \approx 4.71$, it is in quadrant III. The reference angle is
$\theta' = 4.7 - \pi \approx 1.56$.

51. $565° - 360° = 205°$
Because the angle is in quadrant III, the reference angle is $\theta' = 205° - 180° = 25°$.

53. $\frac{17\pi}{6} - 2\pi = \frac{17\pi}{6} - \frac{12\pi}{6} = \frac{5\pi}{6}$
Because the angle is in quadrant II, the reference

43. Because $\frac{}{6}$ lies between $\frac{}{2}=\frac{}{6}$ and $\pi=\frac{}{6}$, it is in quadrant II. The reference angle is

$\theta'=\pi-\frac{5\pi}{6}=\frac{6\pi}{6}-\frac{5\pi}{6}=\frac{\pi}{6}$.

53. $\frac{17\pi}{6}-2\pi=\frac{17\pi}{6}-\frac{12\pi}{6}=\frac{5\pi}{6}$

Because the angle is in quadrant II, the reference angle is $\theta'=\pi-\frac{5\pi}{6}=\frac{\pi}{6}$.

55. $\frac{23\pi}{4}-4\pi=\frac{23\pi}{4}-\frac{16\pi}{4}=\frac{7\pi}{4}$

Because the angle is in quadrant IV, the reference angle is $\theta'=2\pi-\frac{7\pi}{4}=\frac{\pi}{4}$.

57. $-\frac{11\pi}{4}+4\pi=-\frac{11\pi}{4}+\frac{16\pi}{4}=\frac{5\pi}{4}$

Because the angle is in quadrant III, the reference angle is $\theta'=\frac{5\pi}{4}-\pi=\frac{\pi}{4}$.

59. $-\frac{25\pi}{6}+6\pi=-\frac{25\pi}{6}+\frac{36\pi}{6}=\frac{11\pi}{6}$

Because the angle is in quadrant IV, the reference angle is $\theta'=2\pi-\frac{11\pi}{6}=\frac{\pi}{6}$.

67. $\frac{2\pi}{3}$ lies in quadrant II. The reference angle is

$\theta'=\pi-\frac{2\pi}{3}=\frac{3\pi}{3}-\frac{2\pi}{3}=\frac{\pi}{3}$.

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

Because the sine is positive in quadrant II,

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

69. $\frac{7\pi}{6}$ lies in quadrant III. The reference angle is

$\theta'=\frac{7\pi}{6}-\pi=\frac{7\pi}{6}-\frac{6\pi}{6}=\frac{\pi}{6}$.

$\csc\frac{\pi}{6}=2$

Because the cosecant is negative in quadrant III,

$\csc\frac{7\pi}{6}=-\csc\frac{\pi}{6}=-2$.

71. $\frac{9\pi}{4}$ lies in quadrant I. The reference angle is

$\theta'=\frac{9\pi}{4}-2\pi=\frac{9\pi}{4}-\frac{8\pi}{4}=\frac{\pi}{4}$.

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

Because the tangent is positive in quadrant I,

$\tan\frac{9\pi}{4}=\tan\frac{\pi}{4}=1$

73. –240° lies in quadrant II. The reference angle is $\theta'=240°-180°=60°$.

$\sin 60°=\frac{\sqrt{3}}{2}$

Because the sine is positive in quadrant II,

$\sin(-240°)=\sin 60°=\frac{\sqrt{3}}{2}$.

75. $-\frac{\pi}{4}$ lies in quadrant IV. The reference angle is

$\theta'=\frac{\pi}{4}$.

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

Because the tangent is negative in quadrant IV,

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

77. $\sec 495°=\sec 135°=-\sqrt{2}$

79. $\cot\frac{19\pi}{6}=\cot\frac{7\pi}{6}=\sqrt{3}$

81. $\cos\dfrac{23\pi}{4} = \cos\dfrac{7\pi}{4} = \dfrac{\sqrt{2}}{2}$

83. $\tan\left(-\dfrac{17\pi}{6}\right) = \tan\dfrac{7\pi}{6} = \dfrac{\sqrt{3}}{3}$

85. $\sin\left(-\dfrac{17\pi}{3}\right) = \sin\dfrac{\pi}{3} = \dfrac{\sqrt{3}}{2}$