## § 5.1 THE UNIT CIRCLE

# 3, 5, 17, 19, 23-53 ODD, 59

**3.** $x^2 + y^2 = 1$ : UNIT CIRCLE

$$\left(\frac{3}{5}\right)^2 + \left(-\frac{4}{5}\right)^2 = \frac{9+16}{25} = 1 \quad \checkmark$$

**5.** $x^2 + y^2 = 1$

$$\left(\frac{3}{4}\right)^2 + \left(-\frac{\sqrt{7}}{4}\right)^2 = \frac{9+7}{16} = 1 \quad \checkmark$$

**17.** $x^2 + y^2 = 1$

$$x^2 + \left(\frac{2}{3}\right)^2 = 1 \qquad \left(y\text{-COORD} = \frac{2}{3}\right)$$

$$x^2 = 1 - \frac{4}{9}$$

$$x = \pm\sqrt{\frac{5}{9}}$$

$$\boxed{x = -\frac{\sqrt{5}}{3}} \qquad (x\text{-COORD IS NEG.})$$

**19.** $x^2 + y^2 = 1$

$$\left(\frac{-\sqrt{2}}{3}\right)^2 + y^2 = 1$$

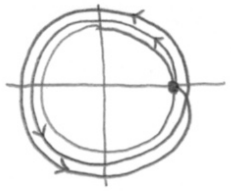
$$\frac{2}{9} + y^2 = 1$$

$$y = \pm\sqrt{\frac{7}{9}}$$

$$\boxed{y = -\frac{\sqrt{7}}{3}} \qquad \left(\begin{array}{l}\text{BELOW X-AXIS} \\ \Rightarrow y\text{-COORD NEG.}\end{array}\right)$$

23. $4\pi = 2(2\pi)$

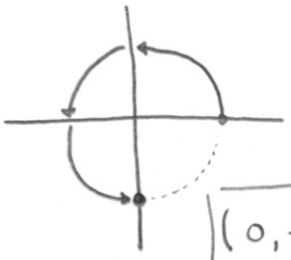
$= 2 \times$ CIRCUMFERENCE



$(1, 0)$

25. $\frac{3\pi}{2} = 3\left(\frac{\pi}{2}\right) = 3 \times$ QUARTER-CIRCUMFERENCE

$\left(\frac{1}{4} \times 2\pi = \frac{\pi}{2}\right)$

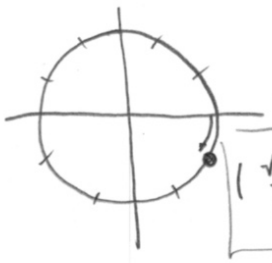


$(0, -1)$

27. $-\frac{\pi}{6} = -\frac{1}{12}(2\pi)$

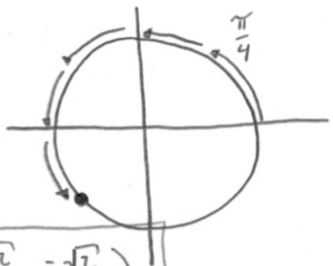
↑ CLOCKWISE!

$\frac{1}{12}^{TH}$ OF THE WAY AROUND, CLOCKWISE



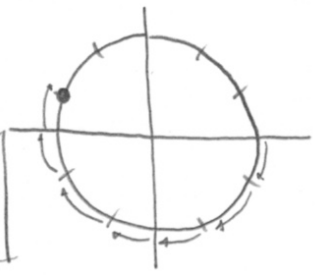
$\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

29.



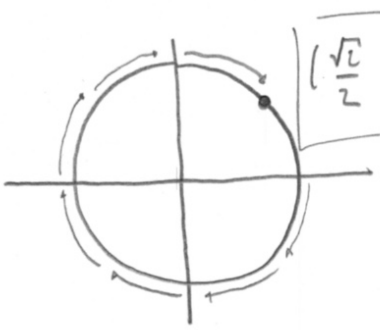

$\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

31. $t = -\frac{7\pi}{6}$



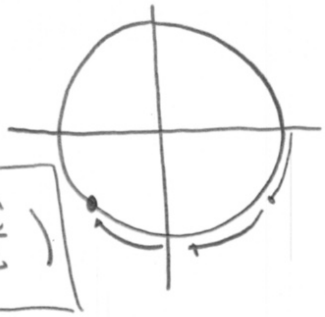
$\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

33. $t = -\frac{7\pi}{4}$



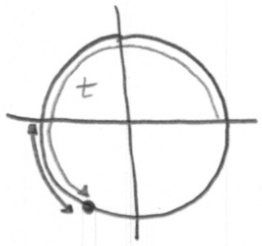
$\left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$

35. $t = -\frac{3\pi}{4}$



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

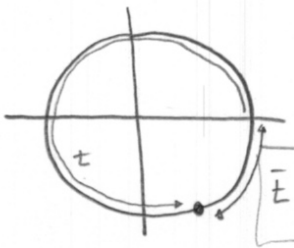
37. (a) $t = \frac{4\pi}{3}$




$\bar{t} = \frac{\pi}{3}$

Note: $\frac{4\pi}{3} = \pi + \frac{\pi}{3}$

(b) $t = \frac{5\pi}{3}$

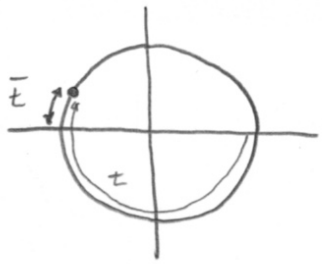



$\bar{t} = \frac{\pi}{3}$

Note: $\frac{5\pi}{3} = 2\pi - \frac{\pi}{3}$

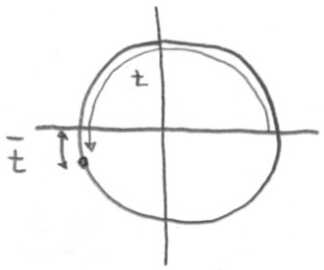
(c) $t = -\frac{7\pi}{6} = -\pi - \frac{\pi}{6}$

$\boxed{\bar{t} = \frac{\pi}{6}}$




(d) $t = 3.5 = \pi + (3.5 - \pi)$

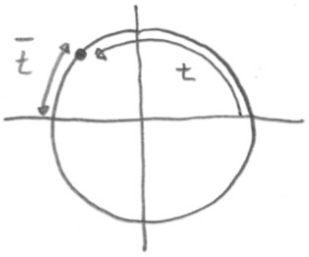
$\boxed{\bar{t} = 3.5 - \pi}$




(a)

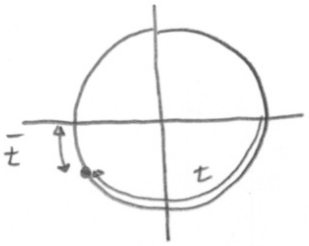
39. $t = \frac{5\pi}{7} = \pi - \frac{2\pi}{7}$

$\boxed{\bar{t} = \frac{2\pi}{7}}$



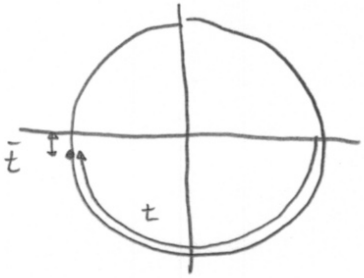

(b) $t = -\frac{7\pi}{9} = -\pi + \frac{2\pi}{9}$

$\boxed{\bar{t} = \frac{2\pi}{9}}$



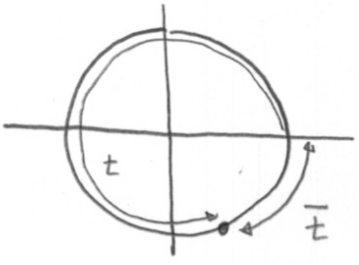

(c) $t = -3 = -\pi + (\pi - 3)$

$\boxed{\bar{t} = \pi - 3}$




(d) $t = 5 = 2\pi - (2\pi - 5)$

$\boxed{\bar{t} = 2\pi - 5}$



41. (a) $\bar{t} = \frac{\pi}{6}$ (b) $\left(\frac{\sqrt{3}}{2}, -\frac{1}{2}\right)$

43. (a) $\bar{t} = \frac{\pi}{3}$ (b) $\left(-\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

45. (a) $\bar{t} = \frac{\pi}{3}$ (b) $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

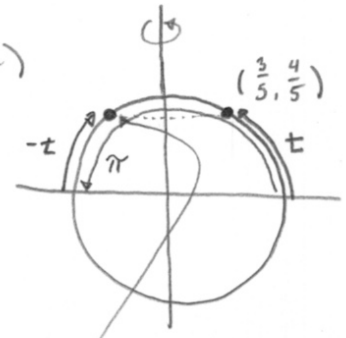
47. (a) $\bar{t} = \frac{\pi}{4}$ (b) $\left(-\frac{\sqrt{2}}{2}, -\frac{\sqrt{2}}{2}\right)$

49. (a) $\bar{t} = \frac{\pi}{6}$ (b) $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$

51. (a) $\bar{t} = \frac{\pi}{3}$ (b) $\left(\frac{1}{2}, \frac{\sqrt{3}}{2}\right)$

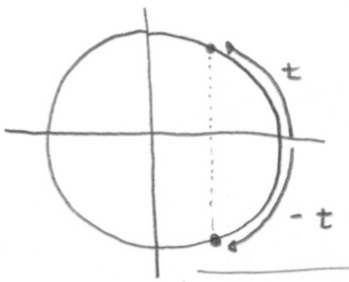
53. (a) $\bar{t} = \frac{\pi}{3}$ (b) $\left(-\frac{1}{2}, -\frac{\sqrt{3}}{2}\right)$

59. (a)



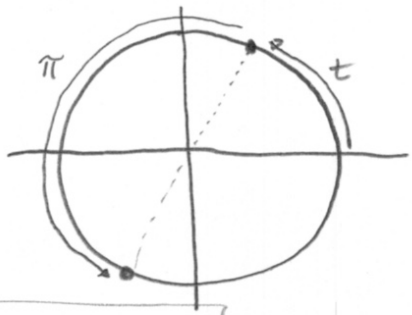

$\left(-\frac{3}{5}, \frac{4}{5}\right)$

(b)




$\left(\frac{3}{5}, -\frac{4}{5}\right)$

(c)




$\left(-\frac{3}{5}, -\frac{4}{5}\right)$

(d) $\left(\frac{3}{5}, \frac{4}{5}\right)$