

Find all solutions of the equation.

$$1. \sin x = -\frac{\sqrt{2}}{2}$$

$$x = \frac{5\pi}{4} + 2\pi n$$

$$x = \frac{7\pi}{4} + 2\pi n$$

$$2. \tan \theta = \sqrt{3}$$

$$\theta = \frac{\pi}{3} + \pi n$$

$$3. \sec \beta = 2$$

$$\cos B = \frac{1}{2}$$

$$B = \frac{\pi}{3} + 2\pi n$$

$$B = \frac{5\pi}{3} + 2\pi n$$

$$4. \sin x = \frac{\pi}{2}$$

$$\emptyset$$

$\frac{\pi}{2} > 1$, so not in range $[-1, 1]$

$$5. \cos \theta = \frac{1}{\sec \theta}$$

All θ except
 $\theta = \frac{\pi}{2} + \pi n$

$$6. 2 \cos 2\theta - \sqrt{3} = 0$$

$$\cos 2\theta = \frac{\sqrt{3}}{2}$$

$$2\theta = \frac{\pi}{6} + 2\pi n$$

$$\theta = \frac{\pi}{12} + \pi n$$

$$2\theta = \frac{11\pi}{6} + 2\pi n$$

$$\theta = \frac{11\pi}{12} + \pi n$$

$$7. \sqrt{3} \tan \frac{1}{3}t = 1$$

$$\tan \frac{1}{3}t = \frac{1}{\sqrt{3}}$$

$$\frac{1}{3}t = \frac{\pi}{6} + \pi n$$

$$t = \frac{\pi}{2} + 3\pi n$$

$$8. \sin(\theta + \frac{\pi}{4}) = \frac{1}{2}$$

$$\theta + \frac{\pi}{4} = \frac{\pi}{6} + 2\pi n$$

$$\theta = -\frac{\pi}{12} + 2\pi n$$

$$\theta + \frac{\pi}{4} = \frac{5\pi}{6} + 2\pi n$$

$$\theta = \frac{7\pi}{12} + 2\pi n$$

$$10. 2 \cos t + 1 = 0$$

$$\cos t = -\frac{1}{2}$$

$$t = \frac{2\pi}{3} + 2\pi n$$

$$t = \frac{4\pi}{3} + 2\pi n$$

$$11. \tan^2 x = 1$$

$$\tan x = \pm 1$$

$$x = \frac{\pi}{4} + \pi n$$

$$x = \frac{3\pi}{4} + \pi n$$

$$12. (\cos \theta - 1)(\sin \theta + 1) = 0$$

$$\cos \theta = 1 \quad \sin \theta = -1$$

$$\theta = 2\pi n$$

$$\theta = \frac{3\pi}{2} + 2\pi n$$

13. $2 \cos x = \sqrt{3}$

$$\cos x = \frac{\sqrt{3}}{2}$$

$$x = \frac{\pi}{6} + 2\pi n$$

$$x = \frac{11\pi}{6} + 2\pi n$$

14. $\sec^2 \alpha - 4 = 0$

$$\sec^2 \alpha = 4$$

$$\sec \alpha = \pm 2$$

$$\alpha = \frac{\pi}{3} + \pi n$$

$$\alpha = \frac{2\pi}{3} + \pi n$$

15. $\sqrt{3} + 2 \sin \beta = 0$

$$\sin \beta = -\frac{\sqrt{3}}{2}$$

$$\beta = \frac{4\pi}{3} + 2\pi n$$

$$\beta = \frac{5\pi}{3} + 2\pi n$$

16. $\cot^2 x - 3 = 0$

$$\cot^2 x = 3$$

$$\cot x = \pm \sqrt{3}$$

$$x = \frac{\pi}{6} + \pi n$$

$$x = \frac{5\pi}{6} + \pi n$$

17. $(2 \sin \theta + 1)(2 \cos \theta + 3) = 0$

$$\sin \theta = -\frac{1}{2}$$

$$\cos \theta = -\frac{3}{2}$$

$$\theta = \frac{7\pi}{6} + 2\pi n$$

$$\theta = \frac{11\pi}{6} + 2\pi n$$

18. $(2 \sin u - 1)(\cos u - \sqrt{2}) = 0$

$$\sin u = \frac{1}{2}$$

$$\cos u = \sqrt{2}$$

$$u = \frac{\pi}{6} + 2\pi n$$

$$u = \frac{5\pi}{6} + 2\pi n$$

Find the solutions of the equation that are in the interval $[0, 2\pi]$.

19. $\cos(2x - \frac{\pi}{4}) = 0$

$$2x - \frac{\pi}{4} = \frac{\pi}{2} + \pi n$$

$$x = \frac{3\pi}{8} + \frac{\pi}{2} n$$

$$n=0, 1, 2, 3$$

$$x = \frac{3\pi}{8}, \frac{7\pi}{8}, \frac{11\pi}{8}, \frac{15\pi}{8}$$

22. $\tan^2 x \sin x = \sin x$

$$\tan^2 x \sin x - \sin x = 0$$

$$\sin x (\tan^2 x - 1) = 0$$

$$\sin x = 0 \quad \tan x = \pm 1$$

$$x = 0, \pi, \frac{\pi}{4}, \frac{3\pi}{4}, \frac{5\pi}{4}, \frac{7\pi}{4}$$

20. $2 - 8 \cos^2 t = 0$

$$\cos^2 t = \frac{1}{4}$$

$$\cos t = \pm \frac{1}{2}$$

$$t = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$$

21. $2 \sin^2 u = 1 - \sin u$

$$2 \sin^2 u + \sin u - 1 = 0$$

$$(2 \sin u - 1)(\sin u + 1) = 0$$

$$\sin u = \frac{1}{2}; \sin u = -1$$

$$u = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{3\pi}{2}$$

23. $2 \cos^2 y + \cos y = 0$

$$\cos y (2 \cos y + 1) = 0$$

$$\cos y = 0; \cos y = -\frac{1}{2}$$

$$y = \frac{\pi}{2}, \frac{3\pi}{2}, \frac{2\pi}{3}, \frac{4\pi}{3}$$

24. $\sin^2 \theta + \sin \theta - 6 = 0$

$$(\sin \theta + 3)(\sin \theta - 2) = 0$$

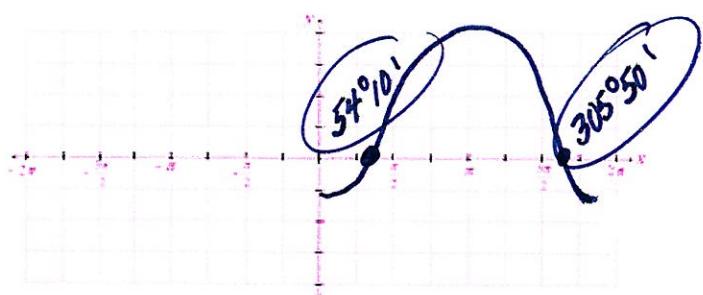
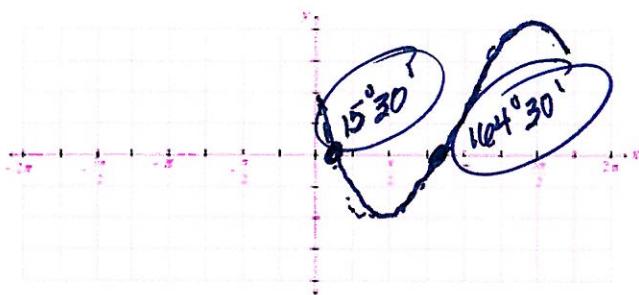
$$\sin \theta = -3; \sin \theta = 2$$

$$\emptyset$$

Approximate, to the nearest 10°, the solutions of the equation in the interval $[0^\circ, 360^\circ]$.

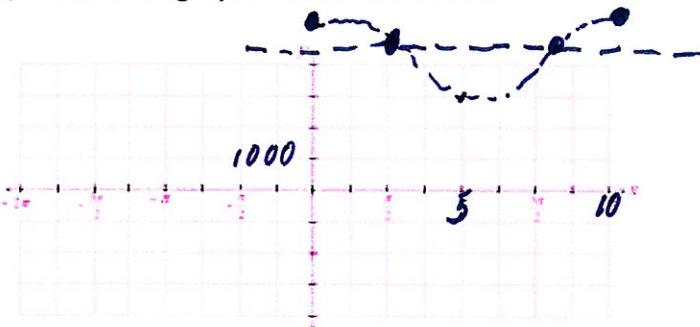
25. $\sin^2 t - 4 \sin t + 1 = 0$

26. $\cos^2 t - 4 \cos t + 2 = 0$



27. Many animal populations, such as that of rabbits, fluctuate over ten-year cycles. Suppose that the number of rabbits at time t (in years) is given by $N(t) = 1000 \cos \frac{\pi}{5}t + 4000$.

- (a) Sketch the graph of N for $0 \leq t \leq 10$.



$$\text{amp: } 1000$$

$$\text{per: } \frac{2\pi}{\pi/5} = 10 \text{ years}$$

- (b) For what values of t in part (a) does the rabbit population exceed 4500?

$$1000 \cos \frac{\pi}{5}t + 4000 > 4500$$

$$\cos \frac{\pi}{5}t > \frac{1}{2}$$

$$0 \leq \frac{\pi}{5}t < \frac{\pi}{3} \quad ; \quad \frac{5\pi}{3} < \frac{\pi}{5}t \leq 2\pi$$

$$0 \leq t < \frac{5}{3} \quad ; \quad \frac{25}{3} < t \leq 10$$