

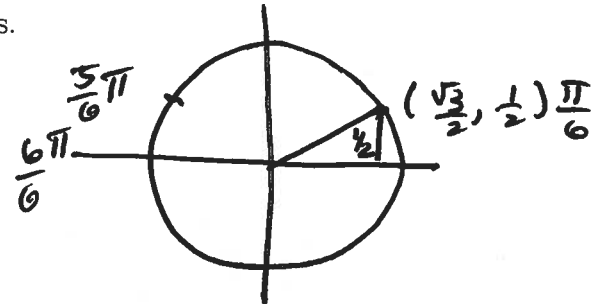
Math 124 Homework §6.3

Find all real solutions. Give exact values in radians.

1. $\sin 2x = 1/2$

$$2x = \frac{\pi}{6} + 2k\pi, \quad 2x = \frac{5\pi}{6} + 2k\pi$$

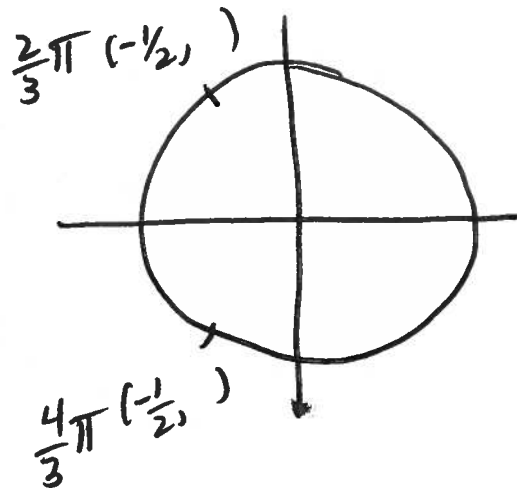
$$x = \frac{\pi}{12} + k\pi, \quad x = \frac{5\pi}{12} + k\pi$$



2. $\cos 3x = -1/2$

$$3x = \frac{2\pi}{3} + 2k\pi, \quad 3x = \frac{4\pi}{3} + 2k\pi$$

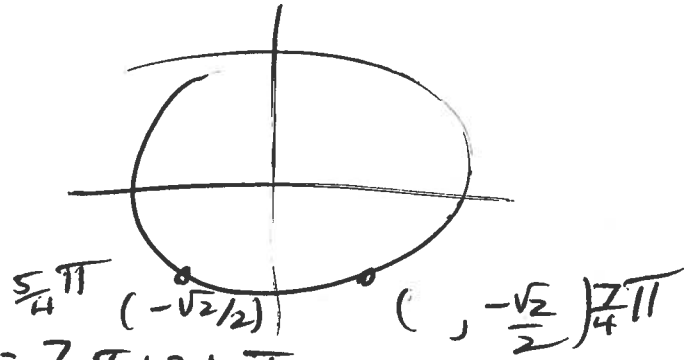
$$x = \frac{2\pi}{9} + k\pi, \quad x = \frac{4\pi}{9} + k\pi$$



$$3. \sin 3x = -\sqrt{2}/2$$

$$3x = \frac{5}{4}\pi + 2k\pi,$$

$$3x = \frac{7}{4}\pi + 2k\pi$$



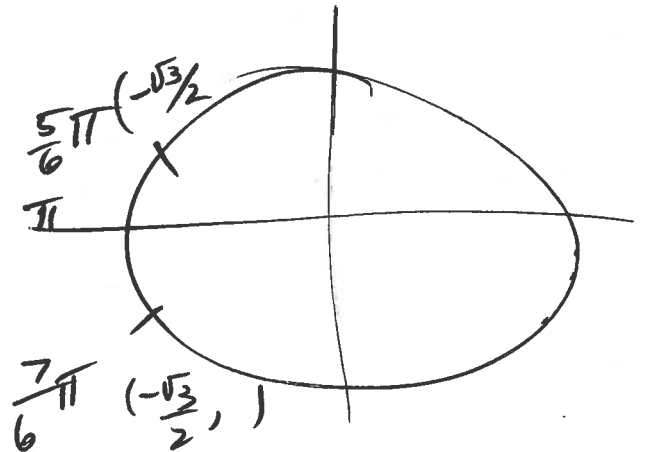
$$x = \frac{5}{12}\pi + \frac{2}{3}k\pi$$

$$x = \frac{7}{12}\pi + \frac{2}{3}k\pi$$

$$4. \cos 2x = -\sqrt{3}/2$$

$$2x = \frac{5}{6}\pi + 2k\pi, \quad 2x = \frac{7}{6}\pi + 2k\pi$$

$$x = \frac{5}{12}\pi + k\pi, \quad x = \frac{7}{12}\pi + k\pi$$



First solve for the trig function. Then give all exact solutions in the interval $[0, 2\pi)$.

5. $2 \sin x + 3 = 4$

$$2 \sin x = 4 - 3$$

$$2 \sin x = 1$$

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

$$x = \frac{\pi}{6}, x = \frac{5}{6} \pi$$

6. $\sin x + 2 = 3$

$$\sin x = 1$$

$$x = \frac{\pi}{2}$$

7. $\tan^2 x + 3 = 0$

$u = \tan x$

$u^2 + 3 = 0$

$u^2 = -3$

no solution!

← Try $\tan^2 x - 3 = 0$
 $u^2 - 3 = 0$
 $u^2 = 3$
 $u = \pm\sqrt{3}$
 $\tan x = \pm \frac{\sqrt{3}}{2}$
 $\frac{\sin x}{\cos x} = \pm \frac{\sqrt{3}/2}{1/2}$
 $x = \frac{\pi}{3}, \frac{2\pi}{3}, \frac{4\pi}{3}, \frac{5\pi}{3}$

8. $2\sin^2 x - \sin x - 1 = 0$

$u = \sin x$

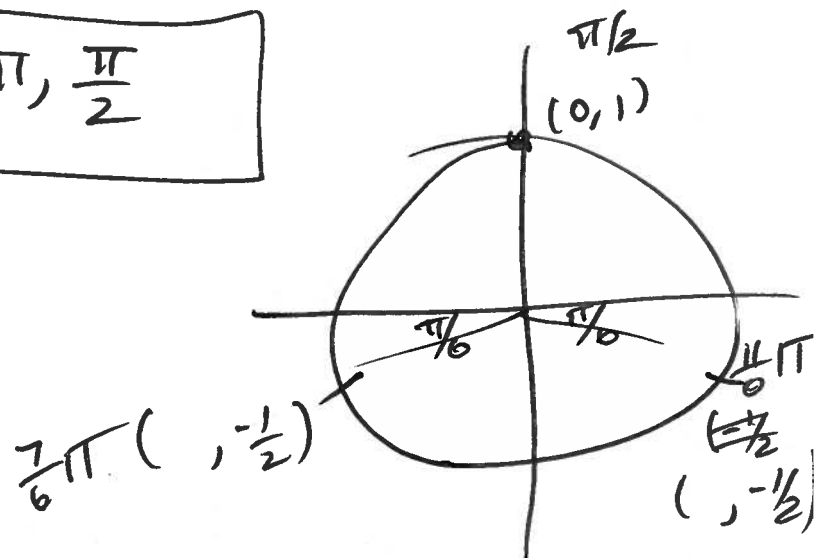
$2u^2 - u - 1 = 0$

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

$u = -\frac{1}{2}, u = 1$

$\sin x = -\frac{1}{2}, \sin x = 1$

$x = \frac{7\pi}{6}, \frac{11\pi}{6}, \frac{\pi}{2}$



9. $-2 \cos^2 x = 3 \cos x + 1$

$$0 = 2 \cos^2 x + 3 \cos x + 1$$

$$2u^2 + 3u + 1 = 0 \quad u = \cos x$$

$$(2u + 1)(u + 1) = 0$$

$$u = -1/2, u = -1$$

$$\cos x = -1/2, \cos x = -1$$

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

10. $\sin 2x = \cos x$. (Hint: Use $\sin 2x = 2 \sin x \cos x$)

$$2 \sin x \cos x = \cos x$$

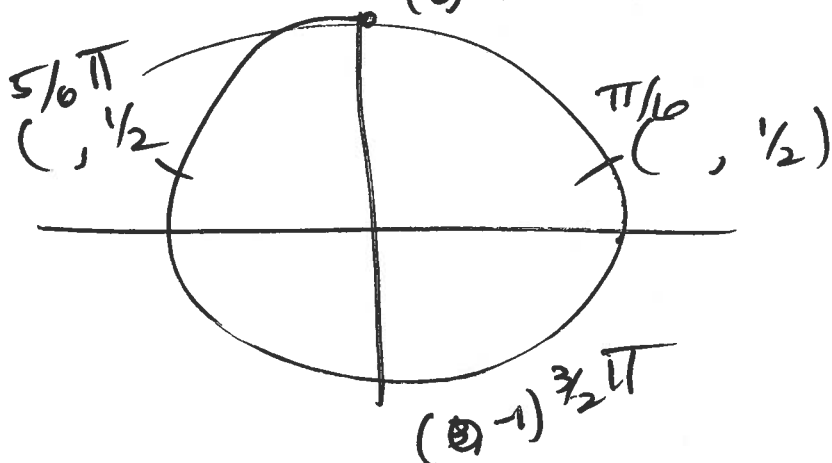
$$2 \sin x \cos x - \cos x = 0$$

$$\cos x (2 \sin x - 1) = 0$$

$$\cos x = 0, \quad 2 \sin x - 1 = 0$$

$$2 \sin x = 1$$

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



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

11. $\sin 2x = \sin x$ (Hint: Use $\sin 2x = 2 \sin x \cos x$)

$$2 \sin x \cos x = \sin x$$

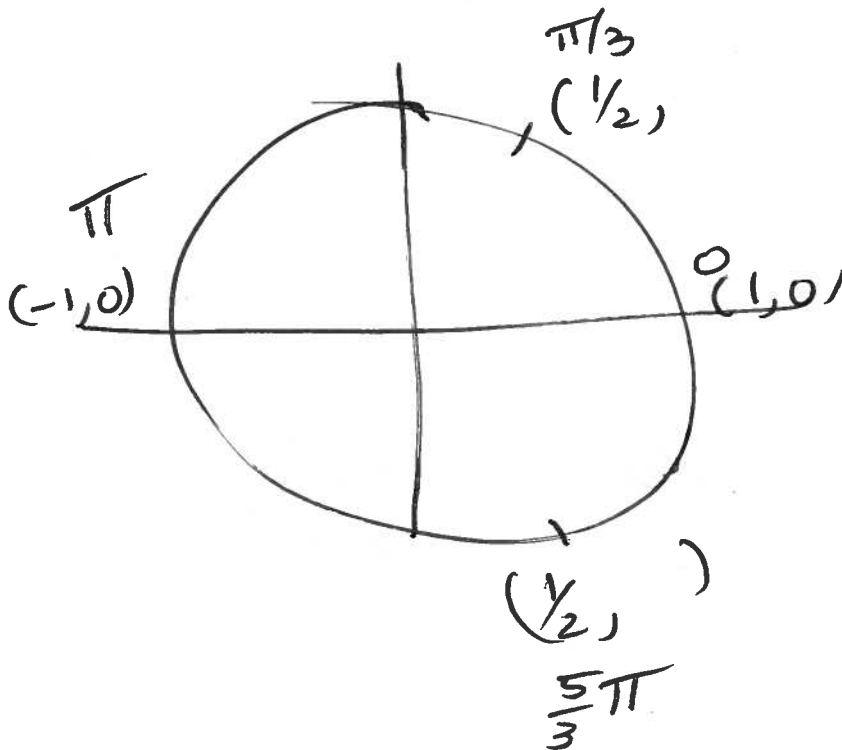
$$2 \sin x \cos x - \sin x = 0$$

$$\sin x (2 \cos x - 1) = 0$$

$$\sin x = 0, \quad 2 \cos x - 1 = 0$$

$$2 \cos x = 1$$

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



$$x = 0, \pi/3, \pi, 5\pi/3$$