include zero

Do not include 2π

Solve over the interval $[0, 2\pi)$.

1) $2\cos x+\sin 2x=0$

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

Factor out $2\cos x$

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

$2\cos x = 0$ $\quad$ $1+\sin x = 0$

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

$\boxed{x = \frac{\pi}{2}, \frac{3\pi}{2}}$ $\quad$ $x = \frac{3\pi}{2}$

Do Not Need to write $\frac{3\pi}{2}$ Twice.

Solve over the interval $[0, 2\pi)$.

2) $\cos 2x - 7\cos x = 3$

Use double angle cos identity with cos.

$2\cos^2 x - 1 - 7\cos x = 3$ $\quad$ combine like terms

$\quad -3 \qquad\qquad -3$

$2\cos^2 x - 7\cos x - 4 = 0$ $\quad$ factor trinomial

$(2\cos x+1)(\cos x-4)=0$

$2\cos x+1=0$ $\quad$ $\cos x-4=0$

$2\cos x=-1$ $\quad$ $\cos x = \cancel{4}$

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

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

(2 4)(1 1)

(2 1)(1 4)

(2 2)(1 2)

Solve over the interval $[0, 2\pi)$.

3) $2\boxed{\sin\frac{\theta}{2}} - \sin\theta = 0$

- replace $\sin\frac{\theta}{2}$
- square both sides

$\left(2\cdot\sqrt{\frac{1-\cos\theta}{2}}\right)^2 = (\sin\theta)^2$

$\cancel{4}^{2}\left(\frac{1-\cos\theta}{\cancel{2}}\right) = \sin^2\theta$

- Replace $\sin^2\theta$ with Pythagorean Identity

$2-2\cos\theta = 1-\cos^2\theta$

$\cos^2\theta - 2\cos\theta + 1 = 0$

$(\cos\theta-1)(\cos\theta-1)=0$

$-\cos\theta$

$-\cos\theta$

$-2\cos\theta$ ✓

$\cos\theta - 1 = 0$

$\cos\theta = 1$

$\boxed{\theta = 0\pi}$

Solve over the interval $[0, 2\pi)$.

4) $\tan\frac{x}{2} = \sin x$

- Multiply both sides by $\sin x$

$\sin x\left(\frac{1-\cos x}{\sin x} = \sin x\right)$

$1-\cos x = \sin^2 x$

$1-\cos x = 1-\cos^2 x$

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

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

$\cos x = 0$ $\cos x - 1 = 0$

$\cos x = 1$

$\boxed{x = \frac{\pi}{2}, \frac{3\pi}{2}}$ $\boxed{x = 0\pi}$