Solving Equations:

Solve over $[0, 2\pi)$

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

$-3\cos x \quad -3\cos x$

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

$\cos x = 1$

$x = \cos^{-1}(1)$

$\boxed{x = 0}$

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

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

$\sqrt{\sin^2 x} = \pm\sqrt{\frac{1}{2}}$

$\sin x = \pm\frac{\sqrt{2}}{2}$

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

3) $\tan^2 x + \tan x = 0$

$\tan x(\tan x + 1) = 0$

$\tan x = 0 \quad \tan x = -1$

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

4) $2\sin^2 x - 5\sin x + 2 = 0$

think $2x^2 - 5x + 2$

$(2x-1)(x-2)$

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

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

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

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

*double angle

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

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

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

$\sin x = 0 \quad \sin x = \frac{1}{2}$

$\boxed{x = 0, \pi, \frac{\pi}{6}, \frac{5\pi}{6}}$

6) $3\cos 2x - 5\cos x = 1$

*double angle

$3(2\cos^2 x - 1) - 5\cos x = 1$

$6\cos^2 x - 3 - 5\cos x = 1$

$6\cos^2 x - 5\cos x - 4 = 0$

$(3\cos x - 4)(2\cos x + 1) = 0$

$\cos x = \frac{4}{3} \quad \cos x = -\frac{1}{2}$

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

7) $2\sin 2x = 1$

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

$0 \le x < 2\pi$

$*0 \le x < 4\pi$

$\sin^{-1}\left(\frac{1}{2}\right) = 2x$

$2x = \frac{\pi}{6}, \frac{5\pi}{6}, \frac{13\pi}{6}, \frac{17\pi}{6}$

$\boxed{x = \frac{\pi}{12}, \frac{5\pi}{12}, \frac{13\pi}{12}, \frac{17\pi}{12}}$

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