

Solve each equation. Write the answer first in general form, showing all solutions, then list the answers over the interval $[0, 2\pi)$.

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

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

$$\text{ALL: } \boxed{x = \frac{\pi}{8} + \pi n, \frac{7\pi}{8} + \pi n}$$

$$[0, 2\pi): \boxed{x = \frac{\pi}{8}, \frac{9\pi}{8}, \frac{7\pi}{8}, \frac{15\pi}{8}}$$

$$3. \tan 3x = \sqrt{3}$$

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

$$\text{ALL: } \boxed{x = \frac{\pi}{9} + \frac{\pi}{3}n} \quad x = \frac{4\pi}{9} + \frac{\pi}{3}n$$

$$[0, 2\pi): \boxed{x = \frac{\pi}{9}, \frac{4\pi}{9}, \frac{7\pi}{9}, \frac{10\pi}{9}, \frac{13\pi}{9}, \frac{16\pi}{9}}$$

$$5. \tan \frac{x}{2} = \frac{\sqrt{3}}{3}$$

$$\frac{x}{2} = \frac{\pi}{6} + \pi n \quad \text{or} \quad \frac{x}{2} = \frac{7\pi}{6} + \pi n$$

$$\text{ALL: } \boxed{x = \frac{\pi}{3} + 2\pi n} \quad \text{or} \quad \frac{7\pi}{3} + 2\pi n$$

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

$$7. \sin(2x + \frac{\pi}{6}) = \frac{1}{2}$$

$$2x + \frac{\pi}{6} = \frac{\pi}{6} + 2\pi n \quad \text{or} \quad 2x + \frac{\pi}{6} = \frac{5\pi}{6} + 2\pi n$$

$$2x = 0 + 2\pi n$$

$$x = 0 + \pi n$$

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

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

$$\text{ALL: } \boxed{x = 0 + \pi n, \frac{\pi}{3} + \pi n}$$

$$[0, 2\pi): \boxed{x = 0, \pi, \frac{\pi}{3}, \frac{4\pi}{3}}$$

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

$$3x = \frac{5\pi}{6} + 2\pi n \quad \text{or} \quad 3x = \frac{7\pi}{6} + 2\pi n$$

$$\text{ALL: } \boxed{x = \frac{5\pi}{18} + \frac{2\pi}{3}n, \frac{7\pi}{18} + \frac{2\pi}{3}n}$$

$$[0, 2\pi): \boxed{x = \frac{5\pi}{18}, \frac{17\pi}{18}, \frac{29\pi}{18}, \frac{7\pi}{18}, \frac{19\pi}{18}, \frac{31\pi}{18}}$$

$$4. \cot \frac{3\theta}{2} = -\sqrt{3}$$

$$\tan \frac{3\theta}{2} = -\frac{\sqrt{3}}{3}$$

$$\frac{3\theta}{2} = \frac{5\pi}{6} + \pi n \quad \text{or} \quad \frac{3\theta}{2} = \frac{11\pi}{6} + \pi n$$

$$\text{ALL: } \boxed{\theta = \frac{5\pi}{9} + \frac{2\pi}{3}n, \frac{11\pi}{9} + \frac{2\pi}{3}n}$$

$$[0, 2\pi): \boxed{\theta = \frac{5\pi}{9}, \frac{11\pi}{9}, \frac{17\pi}{9}}$$

$$6. \sin \frac{2\theta}{3} = -1$$

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

$$\text{ALL: } \boxed{\theta = \frac{9\pi}{4} + 3\pi n}$$

$$[0, 2\pi): \boxed{\theta = \emptyset}$$

$$8. \sin(2x - \frac{\pi}{4}) = \frac{\sqrt{2}}{2}$$

$$2x - \frac{\pi}{4} = \frac{\pi}{4} + 2\pi n \quad \text{or} \quad 2x - \frac{\pi}{4} = \frac{3\pi}{4} + 2\pi n$$

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

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

$$2x = \pi + 2\pi n$$

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

$$\text{ALL: } \boxed{x = \frac{\pi}{4} + \pi n, \frac{\pi}{2} + \pi n}$$

$$[0, 2\pi): \boxed{x = \frac{\pi}{4}, \frac{5\pi}{4}, \frac{\pi}{2}, \frac{3\pi}{2}}$$