Find the values of \(\sin 2\theta\), \(\cos 2\theta\), and \(\tan 2\theta\) for the given value and interval.

1. \(\sin \theta = \frac{12}{13}\), \((0^\circ, 90^\circ)\)
   \[\sin 2\theta = \frac{\sin 2\theta}{\frac{1}{13}}; \cos 2\theta = -\frac{119}{169}; \tan 2\theta = -\frac{120}{119}\]

2. \(\tan \theta = \frac{1}{2}, \left(\frac{\pi}{2}, \pi\right)\)
   \[\sin 2\theta = \frac{4}{5}; \cos 2\theta = \frac{3}{5}; \tan 2\theta = \frac{4}{3}\]

3. \(\cos \theta = \frac{2}{5}, \left(-\frac{\pi}{2}, 0\right)\)
   \[\sin 2\theta = -\frac{4\sqrt{21}}{25}; \cos 2\theta = -\frac{17}{25}; \tan 2\theta = \frac{4\sqrt{21}}{17}\]

4. \(\tan \theta = -\sqrt{3}, \left(\frac{\pi}{2}, \pi\right)\)
   \[\sin 2\theta = -\frac{\sqrt{3}}{2}; \cos 2\theta = -\frac{1}{2}\]

Solve each equation on the interval \([0, 2\pi)\).

5. \(2 \sin \theta \cos \theta = -1\)
   \[\frac{3\pi}{4}, \frac{7\pi}{4}\]

6. \(2 \cos^2 \theta - 3 \cos \theta = 0\)
   \[\frac{\pi}{3}, \frac{5\pi}{3}\]

Solve each equation.

7. \(\cos 2\theta + 2 \cos^2 \theta = 0\)
   \[\frac{\pi}{3} + \pi n, \frac{2\pi}{3} + \pi n\]

8. \(5\theta + 7\theta = 0\)
   \[\frac{\pi}{6} n\]

Rewrite each expression in terms with no power greater than 1.

9. \(\cos^4 \theta \left(\frac{3}{8} + \frac{1}{2} \cos \theta + \frac{1}{8} \cos 2\theta\right)\)

10. \(\sin^4 2\theta \left(\frac{3}{8} - \frac{1}{2} \cos 4\theta + \frac{1}{8} \cos 8\theta\right)\)

Write each product as a sum or difference.

11. \(\cos 2\theta \cos \theta \left(\frac{1}{2} \cos \theta + \frac{1}{2} \cos 3\theta\right)\)

12. \(\cos 5\theta \sin 4x \left(\frac{1}{2} \sin 9x - \frac{1}{2} \sin x\right)\)

13. **BASEBALL** A batter hits a ball with an initial velocity \(v_0\) of 100 feet per second at an angle \(\theta\) to the horizontal. An outfielder catches the ball 200 feet from home plate. Find \(\theta\) if the range of a projectile is given by the formula
   \[R = \frac{1}{32} v_0^2 \sin 2\theta\]
   about 20°