

35.

$$\begin{aligned}
 \text{a) } \sin 3\theta &= \sin(\theta + 2\theta) \\
 &= \sin \theta \cos 2\theta + \sin 2\theta \cos \theta \\
 &= \sin \theta (\cos^2 \theta - \sin^2 \theta) \\
 &\quad + \underbrace{2 \sin \theta \cos \theta \cos \theta} \\
 &= \sin \theta \cos^2 \theta - \sin^3 \theta \\
 &\quad + 2 \sin \theta \cos^2 \theta \\
 &= 3 \sin \theta \cos^2 \theta - \sin^3 \theta \\
 &= 3 \sin \theta (1 - \sin^2 \theta) - \sin^3 \theta \\
 &= 3 \sin \theta - 3 \sin^3 \theta - \sin^3 \theta \\
 &= 3 \sin \theta - 4 \sin^3 \theta
 \end{aligned}$$

$$\begin{aligned}
 \text{b) } \cos 3\theta &= \cos(\theta + 2\theta) \\
 &= \cos \theta \cos 2\theta - \sin \theta \sin 2\theta \\
 &= \cos \theta (\cos^2 \theta - \sin^2 \theta) - \\
 &\quad - \sin \theta \underbrace{2 \sin \theta \cos \theta} \\
 &= \cos^3 \theta - \cos \theta \sin^2 \theta \\
 &\quad - 2 \sin^2 \theta \cos \theta \\
 &= \cos^3 \theta - 3 \cos \theta \sin^2 \theta
 \end{aligned}$$

$$\begin{aligned}
 &= \cos^3 \theta - 3 \cos \theta (1 - \cos^2 \theta) \\
 &= \cos^3 \theta - 3 \cos \theta + 3 \cos^3 \theta \\
 &= 4 \cos^3 \theta - 3 \cos \theta
 \end{aligned}$$

$$\begin{aligned}
 \text{c) } \operatorname{tg} 3\theta &= \operatorname{tg}(\theta + 2\theta) \\
 &= \frac{\operatorname{tg} \theta + \operatorname{tg} 2\theta}{1 - \operatorname{tg} \theta \operatorname{tg} 2\theta} \\
 &= \frac{\operatorname{tg} \theta + \frac{2 \operatorname{tg} \theta}{1 - \operatorname{tg}^2 \theta}}{1 - \operatorname{tg} \theta \frac{2 \operatorname{tg} \theta}{1 - \operatorname{tg}^2 \theta}} \\
 &= \frac{\operatorname{tg} \theta - \operatorname{tg}^3 \theta + 2 \operatorname{tg} \theta}{1 - \cancel{\operatorname{tg}^2 \theta}} \\
 &= \frac{1 - \operatorname{tg}^2 \theta - 2 \operatorname{tg}^2 \theta}{1 - \cancel{\operatorname{tg}^2 \theta}} \\
 &= \frac{3 \operatorname{tg} \theta - \operatorname{tg}^3 \theta}{1 - 3 \operatorname{tg}^2 \theta}
 \end{aligned}$$