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Solution to Problem 1033.

From the half angle formula, we can obtain

$$\tan\frac{x}{2} = \pm\sqrt{\frac{1-\cos x}{1+\cos x}} = \frac{1-\cos x}{\sin x} = \frac{\sin x}{1+\cos x}$$

We also know

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

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

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