# 3.7 Products. Sums. Linear Combinations. and

10. Derive a formula for $\tan 4x$.

$$\begin{aligned}
\tan 4x &= \tan(2x+2x) \\
&= \frac{\tan 2x + \tan 2x}{1 - \tan 2x \tan 2x} \\
&= \frac{2\tan 2x}{1-\tan^2 2x} \\
&= \frac{2 \cdot \frac{2\tan x}{1-\tan^2 x}}{1 - \left(\frac{2\tan x}{1-\tan^2 x}\right)^2} \\
&= \frac{4\tan x}{1-\tan^2 x} \div \frac{(1-\tan^2 x)^2 - 4\tan^2 x}{(1-\tan^2 x)^2} \\
&= \frac{4\tan x}{1-\tan^2 x} \div \frac{1 - 2\tan^2 x + \tan^4 x - 4\tan^2 x}{(1-\tan^2 x)^2} \\
&= \frac{4\tan x}{1-\tan^2 x} \cdot \frac{(1-\tan^2 x)^2}{1 - 6\tan^2 x + \tan^4 x} \\
&= \frac{4\tan x - 4\tan^3 x}{1 - 6\tan^2 x + \tan^4 x}
\end{aligned}$$

11. Let $y = 0$.

$$\begin{aligned}
3.50\sin t + 1.20\sin 2t &= 0 \\
3.50\sin t + 2.40\sin t\cos t &= 0, \text{ Double-Angle Identity} \\
\sin t(3.50 + 2.40\cos t) &= 0 \\
\sin t = 0 \text{ or } 3.50 + 2.40\cos t &= 0 \\
2.40\cos t &= -3.50 \\
\cos t &= -1.46 \rightarrow \text{no solution because } -1 \leq \cos t \leq 1. \\
t &= 0, \pi
\end{aligned}$$