Mathematics 141 Homework.

The homework due Tuesday is

- §2.4: 2abcd, 4, 8, 12, 14, 22, 30, 36.
- §2.5: 2, 14, 16, 18, 22, 24.

Recall that one of the examples we did in class was finding the limit

$$\lim_{\theta \to 0} \frac{1 - \cos(\theta)}{\theta}$$

and Nick suggested using a double formula. The formula in question is

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

Let $x = \theta/2$ to get

$$\cos(\theta) = 1 - 2\sin^2(\theta/2).$$

And recall that we know

$$\lim_{x \to 0} \frac{\sin(x)}{x} = 1.$$

Therefore

$$
\begin{aligned}
\lim_{\theta \to 0} \frac{1 - \cos(\theta)}{\theta} &= \lim_{\theta \to 0} \frac{1 - (1 - 2\sin^2(\theta/2))}{\theta} \\
&= \lim_{\theta \to 0} \frac{2\sin^2(\theta/2)}{\theta} \\
&= \lim_{\theta \to 0} \left(\frac{\sin(\theta/2)}{\theta/2} \right) \sin(\theta/2) \\
&= (1)\sin(0) \\
&= 0.
\end{aligned}
$$

This is at least as nice a solution as the one I gave.