Math 385
Professor Lieberman
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INTEGRALS FROM TUESDAY'S LECTURE

In class, I showed that the integral

$$\int_0^a \sin^2(\lambda x)\,dx$$

is important. Here is the evaluation, which you may quote in homework:

$$\int_0^a \sin^2(\lambda x)\,dx = \frac{a}{2} - \frac{1}{4\lambda}\sin(2\lambda a)$$

for any positive number λ. When λ is one of the eigenvalues from section 2.5, that is, $\lambda = (2n-1)\pi/(2a)$ for some positive integer n, we have

$$\int_0^a \sin^2(\lambda x)\,dx = \frac{a}{2}.$$

For section 2.6, we have $\lambda = \lambda_n$, one of the solutions of the equation

$$\tan(\lambda a) = \frac{-\kappa\lambda}{h},$$

the evaluation becomes

$$\int_0^a \sin^2(\lambda x)\,dx = \frac{a}{2} + \frac{\kappa}{h}\frac{\cos^2(2\lambda a)}{2}.$$