

Physics 451: Homework #5

Due Tuesday, Sep 23, 5:00PM, 2008

2.1

2.4

$$\int x \sin^2(\alpha x) dx = \frac{x^2}{4} - \frac{x \sin(2\alpha x)}{4\alpha} - \frac{\cos(2\alpha x)}{8\alpha^2}$$

$$\int x^2 \sin^2(\alpha x) dx = \frac{x^3}{6} - \frac{x}{4\alpha^2} \cos(2\alpha x) - \left(\frac{x^2}{4\alpha} - \frac{1}{8\alpha^3} \right) \sin(2\alpha x)$$

$$\int \sin^2(\alpha x) dx = \frac{x}{2} - \frac{\sin(2\alpha x)}{4\alpha}$$

2.5

$$\int x \sin(\alpha x) \sin(\beta x) dx = \frac{1}{2} \left[\frac{\cos[(\alpha - \beta)x]}{(\alpha - \beta)^2} + x \frac{\sin[(\alpha - \beta)x]}{(\alpha - \beta)} - \frac{\cos[(\alpha + \beta)x]}{(\alpha + \beta)^2} - x \frac{\sin[(\alpha + \beta)x]}{(\alpha + \beta)} \right]$$

Use Eq. (1.33) on (d)

2.7

$$\int x \sin(\alpha x) dx = \frac{\sin(\alpha x)}{\alpha^2} - \frac{x \cos(\alpha x)}{\alpha}$$

$$\frac{1}{1^2} + \frac{1}{3^2} + \frac{1}{5^2} + \frac{1}{7^2} \dots = \frac{\pi^2}{8}$$