

HW 4, due Wednesday, February 12, 2014

1. Exercise 1.5.3(i)
2. Exercise 1.5.7.
3. Exercise 1.6.7.
4. Exercise 1.6.8.
5. Exercise 1.7.2.
6. Show that $e^{-xy} \sin x$ is integrable with respect to two-dimensional Lebesgue measure on the strip $0 < x < a$, $0 < y$. Perform the double integral in the two orders to get:

$$\int_0^a \frac{\sin x}{x} dx = \frac{\pi}{2} - (\cos a) \int_0^\infty \frac{e^{-ay}}{1+y^2} dy - (\sin a) \int_0^\infty \frac{ye^{-ay}}{1+y^2} dy,$$

and replace $1 + y^2$ by 1 to conclude $|\int_0^a (\sin x)/x dx - \pi/2| \leq 2/a$ for $a \geq 1$.