Consider the function $f(x, y) = \sin(x + y)$. Let $R$ be the region in the $xy$-plane given by

$$R = \left[0, \frac{\pi}{2}\right] \times \left[0, \frac{\pi}{2}\right].$$

(a) Calculate the volume above $R$ and below the surface $z = f(x, y)$.

(b) Calculate the average value of $f$ on the domain $R$.

Calculate the volume of the region bounded by the parabolic cylinder $z = 4 - x^2$ and the planes $z = 0$, $y = 0$, $x = 0$ and $y = 1 - x$. (Hint: Sketch the ‘view from above’.)

Calculate the integral

$$\int_0^1 \int_{x^2}^1 x^3 \sin(y^3) \, dy \, dx.$$ 

Practice Problems

Do not turn these in.

Section 12.1, # 3, 5, 9, 11, 13

Section 12.2, # 1, 3, 5, 7, 9, 21, 25, 27

Section 12.3, # 1, 3, 5, 7, 9, 11, 13, 15, 17, 19, 23, 25, 33, 35, 37, 39, 41, 43