1. Calculate the iterated integral
\[ \int_{1}^{2} \int_{-1}^{1} (x + y^2) \, dx \, dy. \]

**Sol.** We first do the inner integral
\[ \int_{-1}^{1} (x + y^2) \, dx = \frac{x^2}{2} + y^2 x \bigg|_{-1}^{1} = \left( \frac{12}{2} + y^2 \cdot 1 \right) - \left( \frac{(-1)^2}{2} + y^2 \cdot (-1) \right) = 2y^2. \]

Now we do the outer integral
\[ \int_{1}^{2} \left[ \int_{-1}^{1} (x + y^2) \, dx \right] \, dy = \int_{1}^{2} 2y^2 \, dy = \frac{2y^3}{3} \bigg|_{1}^{2} = \frac{2 \cdot 2^3}{3} - \frac{2 \cdot 1^3}{3} = \frac{16}{3} - \frac{2}{3} = \frac{14}{3}. \]

**Ans.:** \( \frac{14}{3} \).

**Comment:** About 90% got it perfectly. As usual, a few people messed up the (easy!) arithmetic, and a couple of people tried “shortcuts”, but messed up in using them.

2. Calculate the double integral
\[ \int \int_{R} \frac{x^2 y}{x^3 + 1} \, dA, \quad R = \{ (x, y) \bigg| 0 \leq x \leq 1, \, -1 \leq y \leq 1 \}. \]

**Sol.:** Making it into an iterated integral we have
\[ \int_{0}^{1} \int_{-1}^{1} \frac{x^2 y}{x^3 + 1} \, dy \, dx. \]

This integrand has the property that it is **separable** i.e. a product of a function of \( x \)-alone (namely \( x^2/(x^3 + 1) \)) and a function of \( y \)-alone (namely \( y \)), so it is **legitimate** to use the shortcut:
\[ \left( \int_{0}^{1} \frac{x^2}{x^3 + 1} \, dx \right) \left( \int_{-1}^{1} y \, dy \right). \]

Since the second integral is obviously 0, we don’t even have to bother to compute the first integral, since **everything** times zero, is 0 (0 kills everything, and if I know that you are going to die, why bother getting to know you). The answer is 0.

**Comment:** About 80% got it perfectly. A few people made it harder than it should be, and messed up.