1. For each of the following integrals, identify whether it is a definite integral or indefinite integral, then compute it. *(Hint: geometry).*

$$\text{(a) } \int_0^1 2x\,dx \quad \text{(b) } \int \sec^2(2x)\,dx \quad \text{(c) } \int_{-1}^1 |x|\,dx$$

2. Let

$$f(x) = \frac{\pi^2}{\sin^2(\pi x)}.$$

Compute $f'(x)$ and $f''(x)$.

3. Compute the following indefinite integrals:

$$\text{(a) } \int (x^{1/2} - 3x^{4/3})\,dx \quad \text{(b) } \int (2\sin(y) + e^{3y})\,dy \quad \text{(c) } \int (s^3 - \sin(p) + 4qp)\,dq$$

4. Estimate the value of

$$\int_0^{3\pi/2} (\sin(x) + 1)\,dx$$

using left and right Riemann sums. Use $n = 6$ intervals.

5. Compute, without using the fundamental theorem of calculus,

$$\int_0^3 \sqrt{9 - x^2}\,dx.$$