1. Compute the following integral:

$$\int_1^4 \sqrt{t}\,\ln t\,dt$$

2. Compute the following integral:

$$\int_0^{\pi/4} \tan^4 \theta \sec^6 \theta \, d\theta$$

3. Compute the following integral:

$$\int \frac{10}{(x-1)(x^2+9)}\,dx$$

4. Compute the following integral:

$$\int \frac{1}{(5 - 4x - x^2)^{5/2}} \, dx$$

5. (a) Set up (but do not solve) the integral for the arc length along the curve $x = y + y^3$ from $y = 1$ to $y = 4$.

(b) Set up (but do not solve) the integral for the surface area of the surface obtained by rotating the curve given by

$$x = a\cos^3 t, \quad y = a\sin^3 t, \quad 0 \leqslant t \leqslant \pi/2$$

about the x-axis. Here a is an arbitrary constant.

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