1. [10] Sketch the region bounded by the curves $y = x^4$ and $y = 1$. Then use an integral to find its area.

2. [10] Use the disk/washer method to find the volume of the solid obtained by rotating the region bounded by $y = x^4$ and $y = 1$ about the $x$-axis.
3. [10] Using the method of cylindrical shells, SET UP a definite integral that would give the volume of the solid obtained by rotating the region bounded by \( y = x^4 \) and \( y = 1 \) about the line \( x = 2 \).

4. [10 each] Evaluate each of the following integrals:
   
   a) \( \int x^3 \ln(x) \, dx \)
b) \[ \int e^{3x} \cos(x) \, dx \]

c) \[ \int \sin^2(x) \cos^3(x) \, dx \]
d) \[ \int \frac{1}{x^2(x - 5)} \, dx \]

e) \[ \int \sqrt{9 - x^2} \, dx \]
5. [10] How large should $n$ be to guarantee that the Midpoint approximation $M_n$ for the integral

$$\int_1^3 (x - \frac{1}{2} x^3) \, dx$$

is accurate to within 0.01?