

1. Use the disk or the shell method to find the volume of the solid generated by revolving the region bounded by the graphs of $y = x^3$, $y = 0$, $x = 2$ about each given line.
 - (a) (5%) the x -axis
 - (b) (5%) the y -axis
 - (c) (5%) the line $x = 4$.

2. (15%) Find the volume of the solid formed by revolving the region bounded by the graphs of $y = x^3 + x + 1$, $y = 1$, and $x = 1$ about the line $x = 2$.

3. (15%) Evaluate the integral

$$\int_0^{\frac{1}{\sqrt{2}}} \frac{\arccos x}{\sqrt{1-x^2}} dx.$$

4. (15%) State "the fundamental theorem of calculus" and "the second fundamental theorem of calculus".

5. (10%) Find $\frac{d}{dx}[\arcsin \sqrt{x}]$.

6. (10%) Find the derivative of $F(x) = \int_{\pi}^{\ln x} \cos e^t dt$.

7. (10%) Let f be twice-differentiable and one-to-one on an open interval I . Show that its inverse function g satisfies

$$g''(x) = -\frac{f''(g(x))}{[f'(g(x))]^3}.$$

8. (10%) Evaluate $\int_1^5 \frac{x}{\sqrt{2x-1}} dx$.