

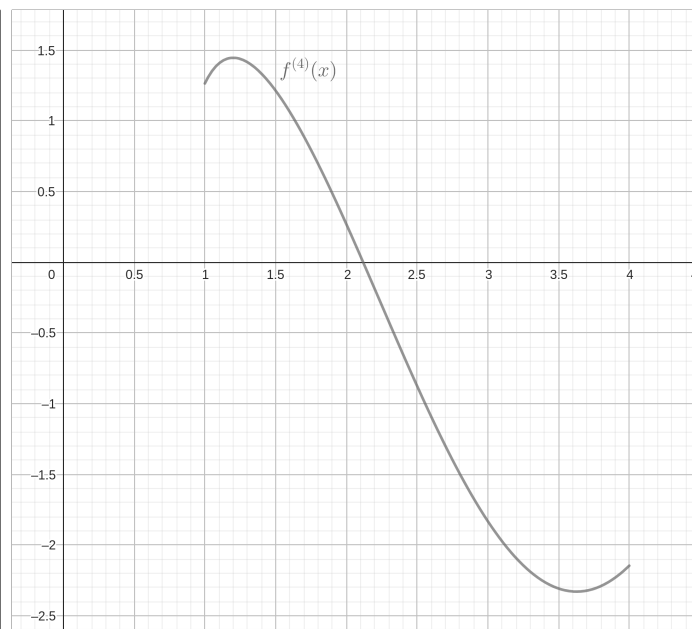
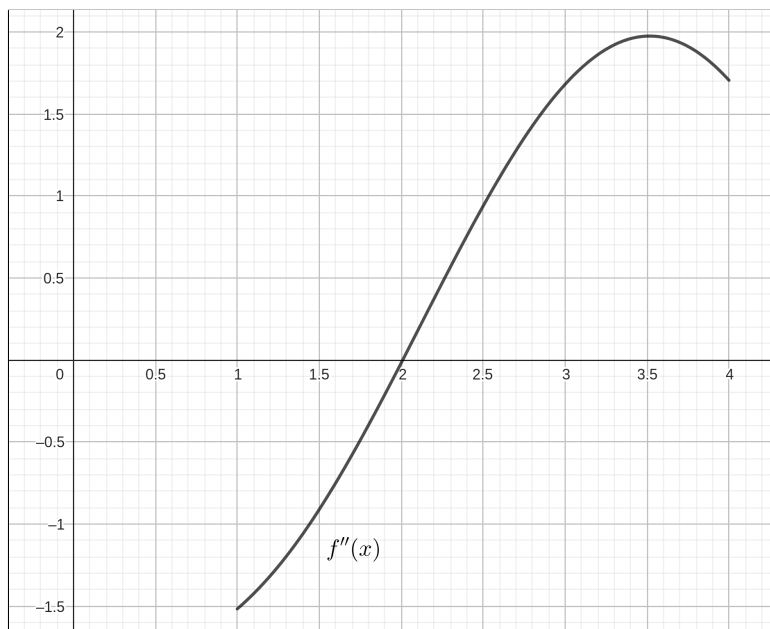
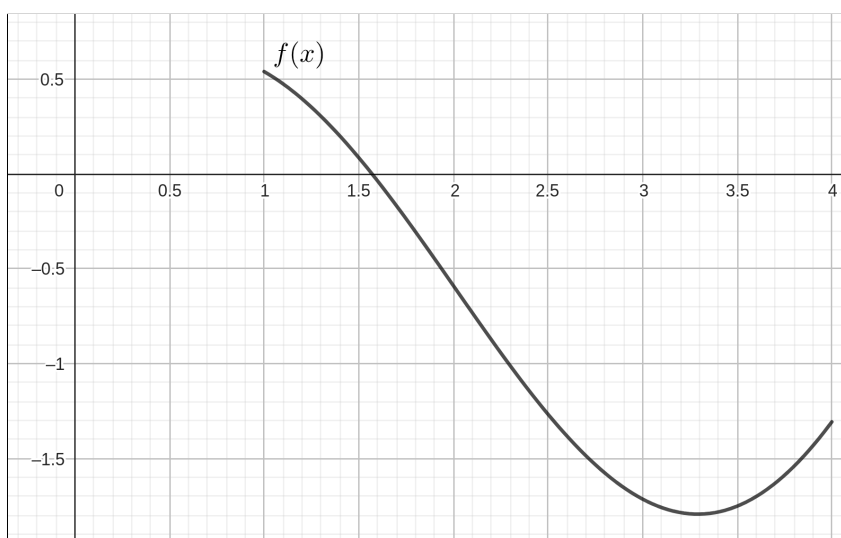
Name: \_\_\_\_\_

Write all of your responses on the extra paper provided. Put your name at the top of all the pages. Show all your work, answers without supporting justification will not receive credit.

1. (20 Points) Use (a) the Trapezoidal Rule, (b) the Midpoint Rule, and (c) Simpson's Rule to approximate

$$\int_1^4 \sqrt{x} \cos(x) dx$$

using  $n = 6$  divisions, correct to at least 5 decimal places. For each case, state the error bound of the approximation. Graphs of  $f(x)$ ,  $f''(x)$ , and  $f^{(4)}(x)$  are given below.



2. (15 Points) Find the following integral if it exists and if it does not show why.

$$\int_e^\infty \frac{1}{x(\ln(x))^2} dx$$

3. (15 Points) Find the exact arc length of the curve,

$$y = \frac{x^3}{3} + \frac{1}{4x}$$

on the interval  $1 \leq x \leq 2$ .

4. **Extra Credit** (5 Points) The surface formed by rotating the curve  $y = 1/x$ ,  $x \geq 1$ , about the  $x$ -axis is known as Gabriel's horn. Show that the surface area is infinite and that the enclosing volume is finite by finding the exact volume. Hence this is an object that you can fill with paint but you can't paint it.

