

Name (print): _____ Signature: _____

You have 30 minutes. Show your work. Notes, calculators not allowed! Problems are on both pages.

Problem 1. (4 pts) Let $f(x) = \begin{cases} x & \text{if } x < 3 \\ 3 & \text{if } x \geq 3 \end{cases}$. Find the average value of $f(x)$ on $[1, 5]$.

Problem 2. (3 pts) Evaluate

$$\int_{-4}^4 7 - \sqrt{16 - x^2} \, dx$$

Problem 3. (4 pts) Evaluate

$$\int 3x\sqrt{7 - 3x^2} \, dx$$

Problem 4. (4 pts) Consider the integral $\int_1^3 e^x - x \, dx$.

- Which sum is an underestimate of the integral? (*Circle the correct answer.*)
 - The left-endpoint Riemann Sum
 - Right-endpoint Riemann sum
 - Neither
- Which sum is an overestimate of the integral? (*Circle the correct answer.*)
 - The left-endpoint Riemann Sum
 - Right-endpoint Riemann sum
 - Neither

(Very briefly) justify your answers!

Problem 5. (4 pts) If $\int_{-2}^7 f(x) \, dx = 12$, $\int_{-2}^0 f(x) \, dx = 20$, and $\int_5^7 f(x) \, dx = 4$, find

$$\int_0^5 3f(x) - x \, dx.$$

Problem 6. (3 pts) Write the right-endpoint Riemann Sum for the function $f(x) = \ln(x)$ on the interval $[2, 4]$ with $n = 5$ subintervals of even length. *Do not evaluate the sum.*