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. Keep your answers in exact form.

1. (*15 points*) Use the limit of the Riemann sum definition with the right-hand endpoint to find the following integral. Evaluate the integral keeping your answer in exact form.

$$\int_1^5 4 - 7x + x^2 \, dx$$

2. (*10 points*) Using the Fundamental Theorem of Calculus, find

$$\frac{d}{dx} \int_5^{x^2-4x} \ln(t^2) \, dt$$

3. (*15 points*) Using the Fundamental Theorem of Calculus, find

   (a) $\displaystyle\int_1^2 (4 + x^2)^3 \, dx$

   (b) $\displaystyle\int_1^5 \frac{3x^2 + 1}{x^3} \, dx$

4. (*10 points*) Find the following indefinite integrals

   (a) $\displaystyle\int \sqrt[3]{x} + \frac{1}{\sqrt[3]{x}} \, dx$

   (b) $\displaystyle\int \frac{\sin(1/x)}{x^2} \, dx$

5. **Extra Credit:** (*5 points*) Use areas (that is of standard geometric figures) to calculate the following. Keep your answer in exact form and simplify when possible. Draw pictures of the region(s) being evaluated.

$$\int_a^b 3x + \sqrt{20 - x^2} \, dx$$

   where a and b are the bounds on the domain of the integrand. Find the exact values of a and b and calculate the integral using areas.