NAME_____
Show work and write clearly.

1. (20 pts.) <u>Without</u> using the *allsums* program,

(a). Estimate the area under the graph of $f(x) = \dfrac{1}{x^2}$ from $x = 2$ to $x = 5$ using three approximating

rectangles and right endpoints. Sketch the graph and the rectangles. Is your estimate an underestimate
or an overestimate? Explain.
(b). Repeat using left endpoints.
(c). Repeat using midpoints.
(d). Which gives the best estimation? Explain.

2. (50 pts.) Using Part 2 of the Fundamental Theorem of Calculus to evaluate the integral, or explain
why it does not exist. For trig functions, you may estimate the answer to 4 decimal places.

a. $\displaystyle\int_{1}^{\sqrt{3}} \frac{6}{1 + x^2}\, dx$
b. $\displaystyle\int_{1}^{9} \frac{5}{3x}\, dx$
c. $\displaystyle\int_{-1}^{-3} \frac{2}{x^6}\, dx$

d. $\displaystyle\int_{-p/3}^{-p/2} \sec x \tan x \sqrt{1 + \sec x}\, dx$
e. $\displaystyle\int_{0}^{1/2} \frac{\sin^{-1} x}{\sqrt{1 - x^2}}\, dx$

3. (10 pts.) Using Part 1 of the Fundamental Theorem of Calculus to find the derivative of the function.

a. $g(u) = \displaystyle\int_{u}^{3} \frac{1}{x + x^2}\, dx$

4. (10 pts.) Calculate the left-hand, right-hand, midpoint and trapezoid sums with 100 subdivisions.
Which of these sums are overestimates and which are underestimates? Explain. Estimate the value of

the definite integral. Explain. $\displaystyle\int_{-2}^{3} \left(1 + \sqrt{9 - x^2}\right) dx$

5. (10 pts.) The graph of g is shown below. The results from the left, right, midpoint and trapezoid

rules used to approximate $\displaystyle\int_{0}^{1} g(t)\, dt$, with the same number of subdivisions for each rule, are as follows:

−0.601, −0.632, −0.633, −0.664.
   a. Match each rule with its approximation. Explain.
   b. Between which two approximations does the true value of the integral lie? Explain.