NAME_____

SIGNATURE_____

Show work and write clearly.

1. Find an antiderivative for the following functions:

   a. $f(t) = 2t^2 + 3t^3 + 4t^4$

   b. $f(x) = x^3 + 5\sqrt{x} - \dfrac{2}{x^2}$

   c. $f(x) = x^{3/2} + \dfrac{\sqrt{x}}{5} - \dfrac{2}{x}$

2. The temperature change, T, in a patient generated by a dose, D, of a drug is given by $T(D) = \left(\dfrac{C}{2} - \dfrac{D}{3} \right) D^2$ where C is a positive constant. What dosage maximizes the temperature change? Explain.

3. The graph of g is shown below. The results from the left, right, midpoint and trapezoid rules used to approximate $\int_0^1 g(t)dt$, 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.
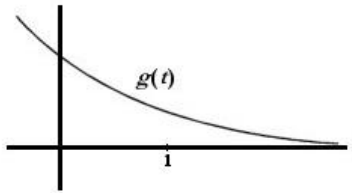
4. Is $\int_{-1}^{1} e^{x^2} dx$ positive, negative or zero? Explain.

5. Given numbers a_1, a_2, a_3, let $f(x) = (x - a_1)^2 + (x - a_2)^2 + (x - a_3)^2$. Where is $f(x)$ a minimum? Explain.

6. Draw up a table of left- and right-hand sums with 2, 10, 50 and 250 subdivisions. Observe the limit to which your sums are tending as the number of subdivisions gets larger, and estimate the value of the definite integral.

   $$\int_{0.2}^{3} \sin\left(\frac{1}{x}\right) dx$$

7. Find the intersection points of the following curves. Estimate the area enclosed by the given curves using 10 subdivisions and the midpoint rule. Check your answer with the twocurve calculator program. Sketch the region. $f(x) = 2x$ and $g(x) = x^2 - 4x$

8. (a) Estimate the area under the graph of $f(x) = -x^2 - 5x + 7$ from $x = -2$ to $x = 1$ using three subdivisions and right endpoints. Sketch the curve and the approximating rectangles. Is the estimate an underestimate or an overestimate? Explain.
   (b) Repeat using left endpoints.
   (c) Repeat using midpoints.
   (d) Which appears to be the best estimate? Explain.