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SM122

Calculus II

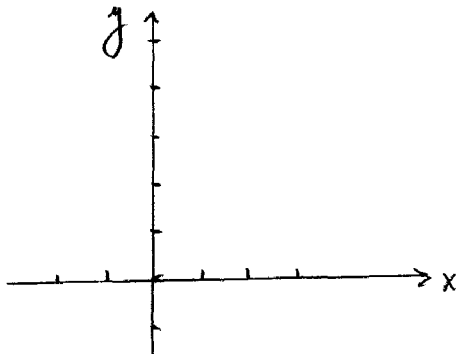
Test I

2 Feb 2011

Name \_\_\_\_\_

1. (a) Find  $f_{ave}$ , the average value of the function  $f(x) = x^2 + 1$  over the interval  $[-1, 2]$ .

(b) Sketch the graph of  $f(x) = x^2 + 1$  over the interval  $[-1, 2]$ , and a rectangle whose area is the same as the area under the graph of  $f(x) = x^2 + 1$ .



(c) Find a number  $c$  where  $f(c) = f_{ave}$  and show  $c$  and  $f_{ave}$  on your graph in (b).

(d) State carefully the Mean Value Theorem for integrals.

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2. Evaluate the following by hand. Show every step.

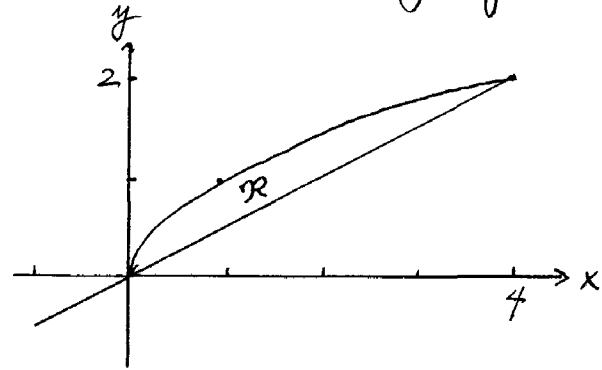
(a)  $\int \cos(e^{3x}) e^{3x} dx$

(b)  $\int [\tan(x)]^{2014} \sec^2(x) dx$

(c)  $\int_0^2 \sqrt{9+x^4} x^3 dx$

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3. The region  $\mathcal{R}$  on the right is bounded by the curves  $y = \sqrt{x}$  and  $y = \frac{1}{2}x$ .



Set up **BUT DO NOT EVALUATE** integrals necessary to find the following:  
(Draw figures and show the element of area or volume you are using to set up the integral.)

(a) The area of the region  $\mathcal{R}$ .

(b) The volume of the solid obtained by rotating the region  $\mathcal{R}$  about the x axis.

(c) The volume of the solid obtained by rotating the region  $\mathcal{R}$  about the vertical line  $x = 4$ .

4. A tank full of water has the shape of a right circular cone of height 7 ft and radius of 3 ft. Set up **BUT DO NOT EVALUATE** an integral to find the work necessary to pump the water out of the top of the tank. (Water has a weight density of  $62.5 \text{ lbs/ft}^3$ ). (Draw and label the segment of water you are using to set up your integral.)

