Calculus I
Fall 2009

Final Exam
Practice Problems 2

Exercise 1. Evaluate the integral.

a. $\displaystyle\int_1^9 \frac{\sqrt{u}-2u^2}{u}\,du$ **b.** $\displaystyle\int_0^1 y(y^2+1)^5\,dy$ **c.** $\displaystyle\int \left(\frac{1-x}{x}\right)^2 dx$

d. $\displaystyle\int \frac{\csc^2 x}{1+\cot x}\,dx$ **e.** $\displaystyle\int_0^1 \frac{x}{1+x^4}\,dx$ **f.** $\displaystyle\int_0^3 \left|x^2-4\right|\,dx$

Exercise 2. Find the derivative of $y = \displaystyle\int_{\sqrt{x}}^{x} \frac{e^t}{t}\,dt$.

Exercise 3. Find $\displaystyle\lim_{h\to 0} \frac{1}{h}\int_2^{2+h} \sqrt{1+t^3}\,dt$. [*Hint:* The answer is 3.]

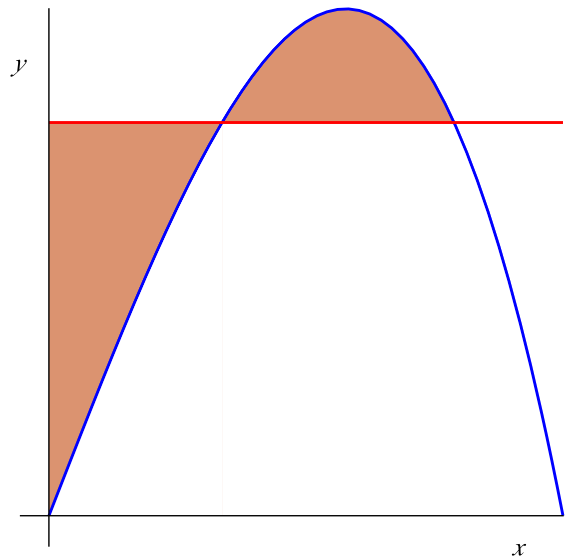
Exercise 4. Determine the interval $[a,b]$ for which the integral $\displaystyle\int_a^b (2+x-x^2)\,dx$ is as large as possible.

Exercise 5. The region between the curves $y = x$ and $y = x^2$ is rotated about the line $x = -1$. Find the volume of the resulting solid using:

a. Cavalieri's Principle;

b. The shell method.

Exercise 6. The figure below shows a horizontal line $y = c$ intersecting the curve $y = 8x - 27x^3$. Find the number c such that the areas of the shaded regions are equal.


y
x