

**Math 125 Practice Problems**  
Spring 2006

1. Evaluate the following integrals:

(a)  $\int \frac{x+1}{x^3+x^2} dx$

(b)  $\int \sin(\sqrt{t}) dt$

(c)  $\int e^{-\theta} \cos 2\theta d\theta$

(d)  $\int \frac{1}{x^2\sqrt{x^2-4}} dx$

(e)  $\int_0^\pi \cos^4\theta d\theta$

(f)  $\int \sec^4(\theta) d\theta$

(g)  $\int_e^{e^2} \frac{1}{x \ln^3 x} dx$

(h)  $\int_4^\infty \frac{1}{x+\sqrt{x}} dx$

(i)  $\int_{-\pi/2}^{\pi/2} \frac{x^2 \sin x}{1+x^6} dx$

(j)  $\int \frac{\arctan x}{1+x^2} dx$

(k)  $\int_0^1 \frac{1}{\sqrt{1-x^2}} dx$

(l)  $\int \frac{1}{x\sqrt{x+1}} dx$

2. Find  $f(x)$  so that  $\int_1^x \left[ \frac{f(t)}{t} - 1 \right] dt = -x^3 + 3x^2 - x - 1$ .

3. For  $F(x) = \int_1^{\cos x} \frac{e^t + 1}{t^2} dt$ , what is  $F'(x)$ ?

4. For  $F(x) = \int_0^x e^{-t} dt$ , for what  $x$ -values is  $F$  increasing?

5. Let  $R$  be the region bounded by  $y = x^2 e^{x^2}$ , the  $x$ -axis, and the  $y$ -axis for  $0 \leq x \leq 2$ . Find the volume of the solid obtained by revolving the region  $R$  about the  $y$ -axis.

6. Find the area between the curves  $y = \cos x$  and  $y = \sin 2x$  between  $x = 0$  and  $x = \pi/2$ .
7. Let  $R$  be the region bounded by  $y = \sqrt{x-1}$ ,  $x = 2$ ,  $x = 5$ , and the  $x$ -axis. What is the volume of the solid obtained by rotating  $R$  about the  $x$ -axis?
8. Two cars travel from the same point in the same direction at the following velocities:  $v_1(t) = t^2 + 2t$  and  $v_2(t) = -t^2 + 12$  for  $t \geq 0$ . What is the distance between the cars at 2 seconds? What is the distance between the cars at 4 seconds?
9. What is the average value of  $y = \sin^3 x \cos^5 x$  over the interval  $\pi/2 \leq x \leq 2\pi$ ?
10. Set up the required sum to estimate  $\int_0^2 e^{1/x} dx$  using Simpson's Rule with  $n=6$ . Do not evaluate.