

## Fall 2005 Math 151

### Week in Review 10

courtesy: Amy Austin

(covering sections 6.1-6.5)

#### Section 6.1

1. Compute  $\sum_{i=2}^5 \frac{i}{i+1}$
2. Write in sigma notation:
  - a.)  $\sqrt{3} + \sqrt{4} + \sqrt{5} + \sqrt{6} + \sqrt{7}$
  - b.)  $1 + \frac{1}{4} + \frac{1}{9} + \frac{1}{16} + \frac{1}{25}$

#### Section 6.2

For problems 3-5, You are given a function  $f$ , an interval  $[a, b]$ , a partition of the interval, and a description of  $x_i^*$  within the  $i$ th subinterval.

- a.) Find the norm of the partition
  - b.) Sketch the function  $f$  and the approximating rectangles
  - c.) Find the sum of the approximating rectangles.
3.  $f(x) = 4 - x^2$ ,  $[0, 2]$ ,  $P = \{0, \frac{1}{4}, \frac{1}{2}, 1, \frac{3}{2}, 2\}$ ,  $x_i^*$  is the right endpoint.
  4.  $f(x) = x^3 + 4$ ,  $[-1, 3]$ ,  $P = \{-1, 0, 1, 2, 3\}$ ,  $x_i^*$  is the midpoint.
  5.  $f(x) = \sin x$ ,  $[0, \pi]$ ,  $P = \{0, \frac{\pi}{4}, \frac{\pi}{2}, \pi\}$ ,  $x_i^*$  is the left endpoint.

#### Section 6.3

6. Use the midpoint rule with  $n = 4$  to approximate  $\int_1^4 \ln x \, dx$ .
7. Use areas to find  $\int_{-1}^0 |2x + 1| \, dx$
8. Express the following as a single integral, if possible.  
 $\int_{-3}^5 f(x) \, dx - \int_{-3}^0 f(x) \, dx + \int_5^6 f(x) \, dx$
9. Express  $\lim_{x \rightarrow \infty} \sum_{i=1}^n \frac{2}{n} \left[ 3 \left( 1 + \frac{2i}{n} \right)^5 - 6 \right]$  as a definite integral
10. Estimate the value of the integral  $\int_0^2 \sqrt{x^3 + 1} \, dx$  by finding an upper and lower bound for  $\sqrt{x^3 + 1}$  on the interval  $[0, 2]$ .

#### Section 6.4

11. find  $\frac{d}{dx} \int_{-1}^{\sin x} \sqrt{1+t^2} \, dt$
12. Compute the following definite integrals.
  - a.)  $\int_1^2 (x^2 - 4x) \, dx$
  - b.)  $\int_1^2 \frac{t^6 - t^2}{x^4} \, dt$
  - c.)  $\int_1^2 \left(x + \frac{1}{x}\right)^2 \, dx$
  - d.)  $\int_0^{\frac{\pi}{2}} (\cos \theta + 2 \sin \theta) \, d\theta$
  - e.)  $\int_{-6}^{-4} \frac{2}{x} \, dx$
  - f.)  $\int_{\ln 2}^{\ln 3} -5e^x \, dx$

#### Section 6.5

13. Compute the following integrals.

- a.)  $\int \frac{2x^2}{\sqrt{x^3 - 1}} \, dx$
- b.)  $\int \frac{x}{x^2 + 1} \, dx$
- c.)  $\int_{-1}^2 x e^{x^2} \, dx$
- d.)  $\int x \cos(2 - x^2) \, dx$
- e.)  $\int_{e^2}^{e^3} \frac{1}{x \ln x} \, dx$
- f.)  $\int \frac{x}{(x+1)^2} \, dx$

14. If  $f$  is continuous and  $\int_0^4 f(x) \, dx = 10$ , find  $\int_0^2 f(2x) \, dx$