Midterm: Some problems for review

The exam will be held in class (Badgley 146) during the class time (9 - 9:50 AM) on Monday February 13. The material covered is Section 3.7 - 5.2. It is a closed book exam. A 4" x 6" handwritten single-sided note card is allowed. A scientific calculator is allowed. Graphing/programmable/transmittable calculators are not allowed.

You should review the homework problems, worksheet problems, examples given in the textbook and in the lectures. It is always a good idea to study for the exam with someone. The types of problems you may be asked on the exam include:

- Estimate an area using Riemann sums.
- Find antiderivatives using the substitution method.
- Find definite integrals using the Fundamental Theorem of Calculus.
- Check if a function is one-to-one. If it is, find the inverse function.
- Simplify or expand functions involving the logarithm.
- Find the limits of functions involving the logarithm.
- Differentiate functions involving the logarithm (using the chain rule).

Additional problems to practice:

1) Use the right-point Riemann sum with $n = 5$ to approximate the following integral. Round your result to four decimal places.
$$\int_0^2 \frac{x}{x+1} dx$$

2) Evaluate the integral and interpret it in terms of areas.
   (a) $\int_{-1}^{2} |x| dx$
   (b) $\int_{0}^{10} |x-5| dx$
   (c) $\int_{-2}^{0} \sqrt{4-x^2} dx$

3) Evaluate the following integrals:
   (a) $\int_1^2 \left(x + \frac{1}{x}\right)^2 dx$
   (b) $\int_1^4 \frac{4+6t}{\sqrt{t}} dt$
   (c) $\int_{-1}^{2} (x - 2|x|) dx$
   (d) $\int_1^4 \frac{x^2+x+1}{x} dx$
   (e) $\int \frac{\cos(\pi/x)}{x^2} dx$
   Hint: use the substitution $u = \pi/x$.

(f) $\int \sqrt{x}\sin(1+x^{3/2})dx$

4) Show that the function $f(x) = x^2 - 2x + 3$ is one-to-one on the interval $(1, 5)$. Find the inverse function of f.

5) Find the limit

$$\lim_{x\to\infty}(\ln(2+x) - \ln(1+x))$$

6) Differentiate the function $f(x) = x^2\ln(2x)$.

Answer keys:

1) 1.0231

2a) 5/2

2b) 25

2c) π

3a) 29/6

3b) 36

3c) -7/2

3d) $\frac{21}{2} + \ln 4$

3e) $-\frac{1}{\pi}\sin\left(\frac{\pi}{x}\right) + C$

3f) $-\frac{2}{3}\cos(1+x^{3/2}) + C$

4) $f^{-1}(y) = 1 + \sqrt{y-2}$

5) 0

6) $x + 2x\ln(2x)$