Exam I Review

Mon Oct 6 15:20:02 PDT 2008 Version 1

Please know the following for the exam Thursday, Oct 9.

1. **Be able to do all problems from the quizes and homework.**
2. Sets and Subsets
   a. know $A \subseteq B$, $x \in A$, $A \cup B$ $A \cap B$ and $A - B$ when A and B are sets.
   b. Know the definitions of special sets $\emptyset$, $\mathbf{R}$, $\mathbf{Q}$, $\mathbf{Z}$ and $\mathbf{N}$.
   c. Problems from Section I 2.5 # 1 and 2.
3. We'll skip the field axioms and order axioms.
4. Know the definitions of upper bound, lower bound, maximum element, minimum element, least upper bound and greatest lower bound.
5. Be able to state Axiom 10: The Least Upper Bound or Completeness Axiom.
6. Be able to convert repeating decimals to fractions.
7. Be able to derive the formula for summing the geometric series $1 + x + x^2 + \cdots + x^n$ and the arithemetic series $1 + 2 + \cdots + n$.
8. Know how to do mathematical induction.
   a. Know Section I 4.4 # 1abcd, I 4.7 # 11abcdef and I 4.10 # 16.
9. Know the definition of absolute value.
   a. Know problems in Section I 4.9 # 2.
10. Be able to compute the area under a positive step function and apply the transformations in Theorems 1.2 – 1.8.
11. Given a step function s such that $\int_0^3 s(x)\,dx = 5$ be able to compute the following:
    a. $\int_0^6 s(x/2)\,dx$?
    b. $\int_1^4 7s(x-1)\,dx$?
    c. $\int_0^1 s(3x)\,dx$?

12. Know the definition and characterization of the greatest integer function.
    a. $[x] = n$ if and only if n is the unique integer such that $n \leq x < n + 1$.
    b. $[x] = \max\{\, n \in \mathbf{Z} : n \leq x \,\}$.
    c. Section 1.11 problem 1d and 1.15 problem 1abcdef.
13. Know the following integration formula:
    a. $\displaystyle\int_a^b x^p dx = \frac{1}{p+1} x^{p+1}\Big|_a^b$
    b. $\displaystyle\int_a^b x^{\frac{1}{p}} dx = \frac{1}{\frac{1}{p}+1} x^{\frac{1}{p}+1}\Big|_a^b$
    c. $\displaystyle\int_a^b \cos(x) dx = \sin(x)\Big|_a^b$
    d. $\displaystyle\int_a^b \sin(x) dx = -\cos(x)\Big|_a^b$
14. Be able to integrate absolute value of polynomials, such as $\displaystyle\int_{-2}^{4} |x^2 - 2| dx$.
15. Find the area between two curves.
    a. The formula is $\displaystyle\int_a^b |f(x) - g(x)| dx$.
    b. Be careful with the absolute value. Make sure to get the sign right and break the integral into pieces when two curves cross each other.
16. Be able to complete the square and find the vertex in in a quadratic function.
    a. Complete the square, find the vertex and x-intercepts of $y = 5x^2 + x - 3$.
17. Know how to do the following integrals.
    a. $\displaystyle\int_3^{17} [x/2]\, dx$
    b. $\displaystyle\int_{-2}^{3} (x-1)(x+3)\, dx$
    c. $\displaystyle\int_0^1 \sin(2x+7)\, dx$
18. **Be able to do all problems from the quizes and homework.**