

## Homework Assignment for Week 10

Assigned Nov 17, 2011.

1. Section 6.4: Problems: 9, 19, 25, 41, 47, 57, 71.

2. Evaluate

$$\lim_{n \rightarrow \infty} \sum_{k=\frac{n}{2}}^n \frac{1}{k}$$

Hint: try to express it in terms of  $\frac{k}{n}$ .

3. Section 6.6: Problems: 17, 21, 27, 33, 37-46, 51, 54, 55.

4. Cauchy's Mean Value Theorem

Prove the following variant of the Mean Value Theorem:

Suppose  $f$  and  $g$  are continuous on  $[a, b]$  and differentiable on  $(a, b)$ , then there exists  $c \in (a, b)$  such that

$$\begin{vmatrix} f(b) - f(a) & f'(c) \\ g(b) - g(a) & g'(c) \end{vmatrix} = 0.$$

Hint: Apply standard Mean Value Theorem to

$$F(x) = \begin{vmatrix} f(b) - f(a) & f(x) - f(a) \\ g(b) - g(a) & g(x) - g(a) \end{vmatrix} \quad \text{on } [a, b].$$

5. Use Cauchy's Mean Value Theorem to prove the strong form of l'Hôpital's rule.

6. Section 6.7: Problems: 5, 7, 8, 11, 12, 17(a), 18.

7. Many of you did not really understand the meaning of  $o$  and  $O$ . Check out and go through page 12 of Chap 6's lecture note (follow the "Study guide and lecture notes" link from course homepage). Some of you might have downloaded an older version. The updated version contains 17 pages.