

Supplementary problems: Sec. 6.1 # 1, 2; 6.2 # 3; 6.3 # 6; 6.4 # 3

Compulsory problems:

Consider the function  $f(x) = \cos x$ .

- (1) [5 pts.] Prove that it is continuous everywhere using the formal definition of limit/continuity. [Hint: You don't have to prove it for the entire domain since it is a periodic function. Think about trig identities.]
- (2) [8 pts.] Prove that it is differentiable everywhere. [Hint: You don't have to prove it for the entire domain since it is a periodic function. Think about trig identities.]
- (3) [4 pts.] Locate all its extremas (max and min points) and state and prove if it is a min or max. (Use Calc I techniques) [Hint: Again, use the fact that it is periodic.]
- (4) [3 pts.] Compute, but don't prove, the limit
$$\lim_{x \rightarrow 0} \frac{\cos x - 1}{x} \tag{1}$$
- (5) [10 pts.] Compute its full Taylor series (write it in series form)
- (6) [7 pts.] Compute the radius of convergence.
- (7) [8 pts.] Using the formal definition of a limit prove that the limit you computed above is correct.

Your homework raw score is:  $\frac{n}{2m} \cdot M + \left(1 - \frac{n}{2m}\right) \cdot N = N + \frac{n}{2m}(M - N)$ . For this homework,  $M = 45$ ,  $m = 5$ ,  $N$  is the number of compulsory problems you get correct, and  $n$  is the number of supplementary problems you complete. It should be noted that for the supplementary problems I will be looking for **full completion**, but I won't take off points for mistakes.