



OKAN ÜNİVERSİTESİ  
MÜHENDİSLİK-MİMARLIK FAKÜLTESİ  
MÜHENDİSLİK TEMEL BİLİMLERİ BÖLÜMÜ

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MAT234 Matematik IV – Ödev 8'in çözümleri

N. Course

15. (a) Since  $\frac{d^n}{dx^n} \cos x$  is either  $\cos x$ ,  $\sin x$ ,  $-\cos x$  or  $-\sin x$ , we can say that  $\left| \frac{d^n}{dx^n} \cos x \right|_{x=c} \leq 1$  for all  $n$ . It follows that  $\left| \frac{f^{(n)}(c) (x-a)^n}{n!} \right| \leq \frac{|x-2\pi|^n}{n!} \rightarrow 0$  as  $n \rightarrow \infty$  for each fixed  $x \in \mathbb{R}$  and for all  $c \in \mathbb{R}$ .

- (b) Since  $f^{(n)}(2\pi) = \begin{cases} 1 & n = 0, 4, 8, \dots \\ -1 & n = 2, 6, 10, \dots \\ 0 & \text{otherwise} \end{cases}$  we have that

$$\begin{aligned} \cos x = 1 & - \frac{(x-2\pi)^2}{2} + \frac{(x-2\pi)^4}{24} - \frac{(x-2\pi)^6}{720} + \frac{(x-2\pi)^8}{40320} - \frac{(x-2\pi)^{10}}{3628800} + \frac{(x-2\pi)^{12}}{479001600} \\ & - \frac{(x-2\pi)^{14}}{87178291200} + \frac{(x-2\pi)^{16}}{20922789888000} - \frac{(x-2\pi)^{18}}{6402373705728000} + \dots \end{aligned}$$