T.C.

İSTANBUL ÜNİVERSİTESİ

MÜHENDİSLİK FAKÜLTESİ

Sınav Sonucu	
İmza	İmza

For God's sake, don't

Fakülte Numarası : forget to write your ID

Adı ve Soyadı : :-)

Yarıyıl :

Ders :

Bölümü :

Tarih :

1) $f(x) = \ln((x+1)(2x+1)) = \ln(x+1) + \ln(2x+1)$. Let $u(x) = \ln(x+1)$. Reapeted differentiation of $u(x) = \ln(x+1)$ yields

$$u'(x) = \frac{1}{x+1}, \quad u''(x) = \frac{-1}{(x+1)^2}, \quad u'''(x) = \frac{1.2}{(x+1)^3}, \quad u^{(4)}(x) = \frac{-1.2.3}{(x+1)^4} \ldots u^{(n)} = \frac{(-1)^{n-1}(n-1)!}{(x+1)^n}$$

So we have $u^{(n)}(0) = (-1)^{n-1}(n-1)!$. Therefore the Maclaurin series of $u(x) = \ln(x+1)$ is

$$u(x) = \ln(x+1) = \sum_{n=0}^{\infty} (-1)^{n-1} (n-1)! \cdot \frac{x^n}{n!} = \sum_{n=0}^{\infty} (-1)^{n-1} \cdot \frac{x^n}{n}$$

If we replace x by $2x$ we get the following

$$u(2x) = \ln(2x+1) = \sum_{n=0}^{\infty} (-1)^{n-1} \frac{2^n . x^n}{n}.$$

Then adding the above two series, we get

$$f(x) = \ln((x+1)(2x+1)) = \ln(x+1) + \ln(2x+1) = u(x) + u(2x)$$

$$= \sum_{n=0}^{\infty} (-1)^{n-1} \frac{x^n}{n} + \sum_{n=0}^{\infty} (-1)^{n-1} \frac{2^n x^n}{n} = \sum_{n=0}^{\infty} (-1)^{n-1} (1+2^n) \frac{x^n}{n}.$$