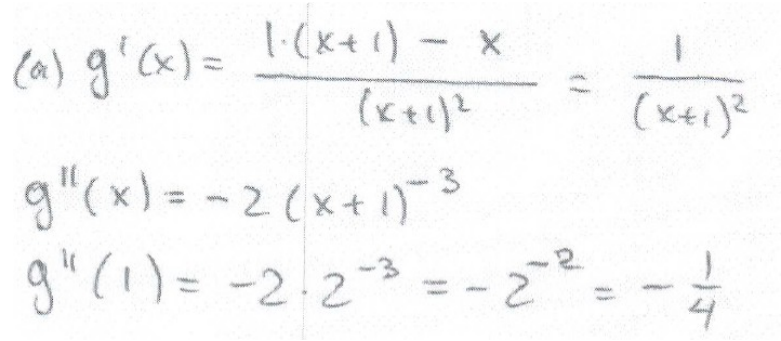
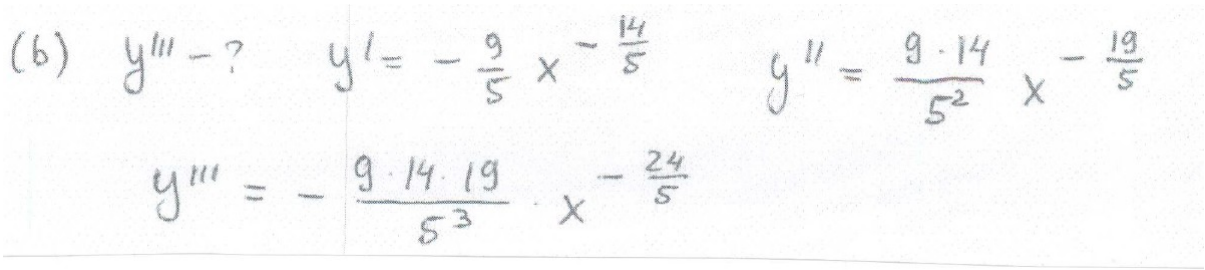
Higher order derivatives

3.5.1





(c) $f(x)$ is a polynomial of degree 2016 with the coefficient in front of x^{2016} equal to $(-1)^{2016}=1$. Differentiation of a polynomial reduces its degree by one. In particular, the derivative of order 2016 of a polynomial of degree 2015 is zero. Moreover, the derivative of the order 2016 of $f(x)$ is equal to the derivative of the order 2016 of the only term of degree 2016, which is x^{2016} (all other terms have smaller degree and will lead to zero derivative of order 2016). Now $(x^{2016})'=2016\,x^{2015}$, $(x^{2016})''=2016\cdot 2015\cdot x^{2014}$, ..., $(x^{2016})^{(2015)}=2016\cdot 2015\cdot\ldots\cdot 2x$, and $(x^{2016})^{(2016)}=2016!$.