ASSIGNMENT 4
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a) $0.60405897 - 0.23899928x + 0.04040541x^2$

b) $f(x) = \ln\left(\frac{x+2}{x+1}\right) = \ln(x+2) - \ln(x+1)$

$f'(x) = \frac{1}{x+2} - \frac{1}{x+1}$

$f^2(x) = -\frac{1}{(x+2)^2} + \frac{1}{(x+1)^2}$

$f^3(x) = \frac{2}{(x+2)^3} - \frac{2}{(x+1)^3}$

$f^4(x) = -6(x+2)^4 + 6(x+1)^4$

$\cancel{6}(x+2)^4 = \cancel{6}(x+1)^4$

$x+2 = x+1$

∴ This is false, hence no local max/min

$f^3(1) = \frac{2}{(3)^3} - \frac{2}{2^3}$

$= \frac{-19}{108}$

$f'^3(2) = \frac{2}{4^3} - \frac{2}{3^3}$

$= -\frac{37}{864}$

$y = (x-1)(x-1.5)(x-2)$
$y = x^3 - 4.5x^2 + 6.5x - 3$
$y' = 3x^2 - 9x + 6.5$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$x = 1.788675135$
$x = 1.211324865$

$x = 1 \Rightarrow y = 0$
$x = 1.211324865 \Rightarrow y = 0.481252$
$x = 1.788675135 \Rightarrow y = 0.048112522$
$x = 2 \Rightarrow y = 0$

$$\left| \frac{f^3(\xi)}{3!} (x - x_0)(x - x_1)(x - x_2) \right|$$

$$\leq \left| \frac{-19/108}{3!} (0.048112522) \right|$$

$\leq 1.410706664 \times 10^{-3}$

Hence $E(x) < 0.01 \Rightarrow x \in [1,2]$

c) The error would decrease as $\frac{f^k(x)}{k!}$ decreases as k increases. The numerator increases slower than the denominator making the error smaller. We know that increasing nodes will increase error especially around the edges. When deriving the coefficients of the terms will grow faster than k!. Hence yes.