A function $f(x)$ has the following properties:

- $f'(x) = \dfrac{x+1}{1+(x+1)^4}$

- the first term in the Maclaurin expansion of $f(x)$ is 1.

(a) Find the Maclaurin expansion of $f(x)$ up to and including the term in x^2. **3**

(b) Use the substitution $u = (x+1)^2$ to find $\displaystyle\int \frac{x+1}{1+(x+1)^4}\,dx$. **3**

(c) Determine an expression for $f(x)$. **2**

Answers:

(a) $\quad 1 + \dfrac{1}{2}x - \dfrac{1}{4}x^2$

(b) $\quad \dfrac{1}{2}\tan^{-1}(x+1)^2 + c$

(c) $\quad \dfrac{1}{2}\tan^{-1}\left(x+1\right)^2 + 1 - \dfrac{\pi}{8}$