

6.

$$f(x) = \frac{x+2}{x^2+9}$$

(a) Show that

$$\int f(x)dx = A \ln(x^2+9) + B \arctan\left(\frac{x}{3}\right) + c$$

where  $c$  is an arbitrary constant and  $A$  and  $B$  are constants to be found.

(4)

(b) Hence show that the mean value of  $f(x)$  over the interval  $[0, 3]$  is

$$\frac{1}{6} \ln 2 + \frac{1}{18} \pi$$

(3)

(c) Use the answer to part (b) to find the mean value, over the interval  $[0, 3]$ , of

$$f(x) + \ln k$$

where  $k$  is a positive constant, giving your answer in the form  $p + \frac{1}{6} \ln q$ , where  $p$  and  $q$  are constants and  $q$  is in terms of  $k$ .

(2)