

17 (a) Use the substitution $u = e^x + 1$ to show that

$$\int \frac{e^{2x}}{e^x + 1} dx = e^x - \ln(e^x + 1) + k$$

[5 marks]

17 (b) Solve the differential equation

$$\left(\frac{e^x + 1}{e^{2x}} \right) \frac{dy}{dx} = \cos^2 y$$

given that $y = \pi$ when $x = 0$

Write your answer in the form

$$\tan y = e^x + \ln \left(\frac{A}{e^x + 1} \right) + B$$

where A and B are constants to be found.

[5 marks]