

$$1. \int_{e^3}^{e^8} \frac{8}{x \sqrt{1+\ln x}} dx = 8 \int_4^9 \frac{1}{\sqrt{u}} du = 8 \cdot \frac{u^{1/2}}{1/2} \Big|_4^9 = 16 \sqrt{u} \Big|_4^9 = 16(\sqrt{9} - \sqrt{4}) = 16$$

$u = 1 + \ln x$
 $du = \frac{1}{x} dx$

$x = e^3 \Rightarrow u = 1 + \ln(e^3) = 1 + 3 = 4$
 $x = e^8 \Rightarrow u = 1 + \ln(e^8) = 1 + 8 = 9$
change limits of integration

$$2. \int_0^{\ln 3} \frac{1}{e^x(4-e^x)} dx = \int_3^{11/3} \frac{1}{u} du = \ln|u| \Big|_3^{11/3} = \ln|11/3| - \ln|3| = \ln\left(\frac{11/3}{3}\right) = \ln\left(\frac{11}{9}\right)$$

$u = 4 - e^{-x}$
 $du = -e^{-x}(-1) dx$
 $= e^{-x} dx$
 $du = \frac{1}{e^x} dx$

$x = 0 \Rightarrow u = 4 - e^0 = 3$
 $x = \ln 3 \Rightarrow u = 4 - e^{-\ln 3}$
 $= 4 - e^{\ln(3^{-1})}$
 $= 4 - \frac{1}{3} = \frac{11}{3}$