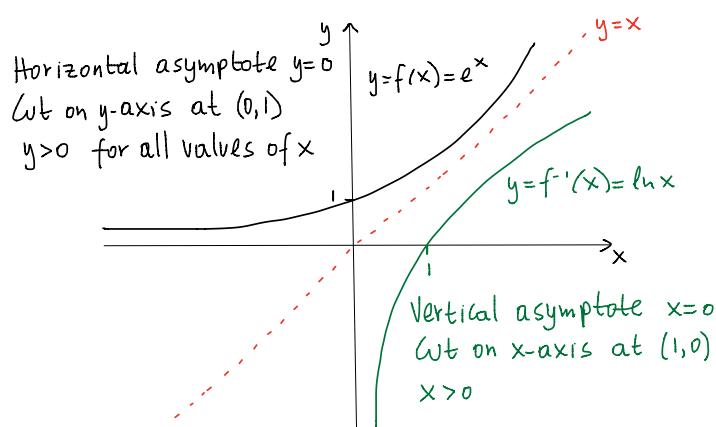# C3 - Chapter 3 - The exponential and log functions - Summary

* The exponential function $y = e^x$ is the function in which the gradient and the function itself are identical, ie $\frac{dy}{dx} = e^x$.

* The inverse of $f(x) = e^x$ is $f^{-1}(x) = \ln x$

Horizontal asymptote $y = 0$
Cut on y-axis at $(0,1)$
$y > 0$ for all values of x

$y = f(x) = e^x$

$y = x$

$y = f^{-1}(x) = \ln x$

Vertical asymptote $x = 0$
Cut on x-axis at $(1,0)$
$x > 0$

* Reminder

$\ln 1 = 0$ $\ln xy = \ln x + \ln y$ $\ln x^k = k \ln x$

$\ln e = 1$ $\ln \left(\frac{x}{y}\right) = \ln x - \ln y$ $\ln \frac{1}{x} = -\ln x$

Also, $e^{2x} = e^{x+x} = e^x \cdot e^x = (e^x)^2$

and $e^{-x} = \frac{1}{e^x}$

In the exam you are expected to be able to:

① Solve exponential and logarithmic equations

② Answer verbal problems (remember: initial means $t = 0$)

③ Sketch graphs. In such a case you can

     - See it as a series of transformations (can be tricky!)

     - consider it on its own by determining any cut(s) on the axes
       and the presence of any asymptotes.