

④②①.

Sept. 23.

To work with logarithms we need the following identities:

$$1) \log_b(xy) = \log_b x + \log_b y.$$

$$2) \log_b(x/y) = \log_b x - \log_b y.$$

$$3) \log_b(x^p) = p \log_b x.$$

Simplify: $\ln\left(\frac{1}{\sqrt{3x+1}}\right)$

(2) $\ln\left(\frac{1}{\sqrt{3x+1}}\right)$

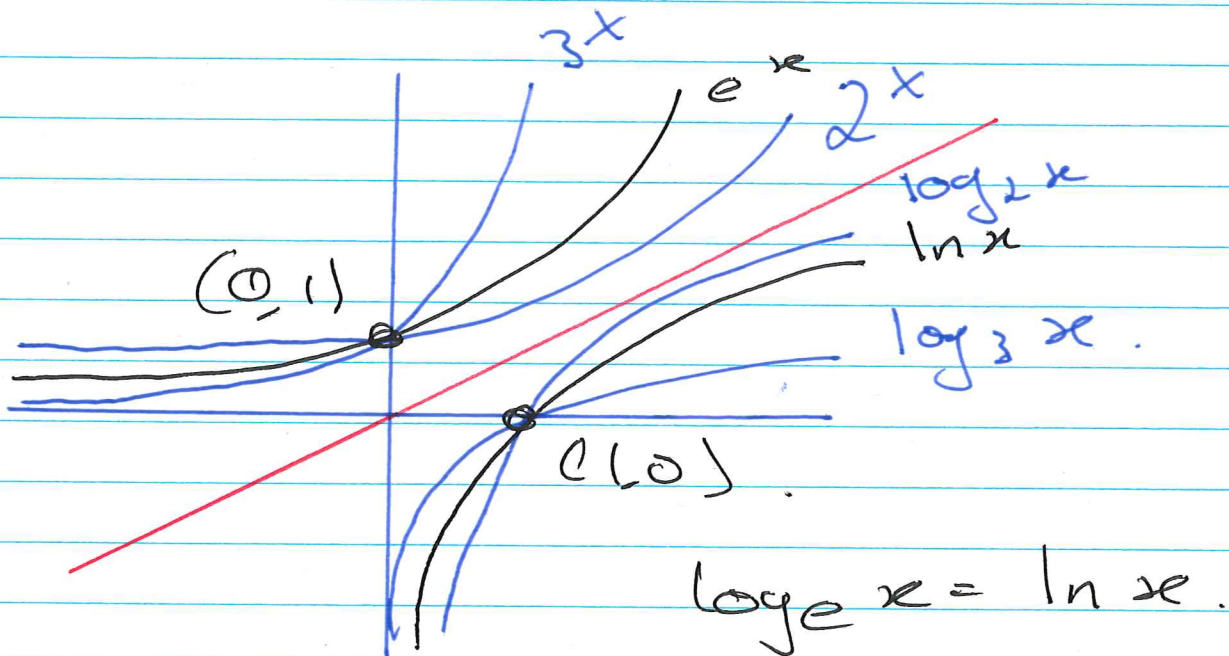
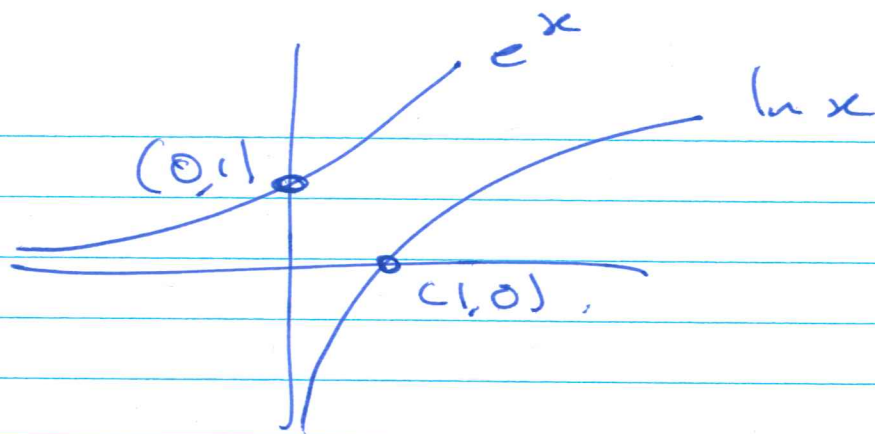
\downarrow
 $= \ln(1) - \ln(\sqrt{3x+1})$

0

$= -\ln((3x+1)^{1/2})$

(3) \downarrow
 $= -\frac{1}{2} \ln(3x+1)$

2



Example: Solve for x :

$$e^{2x} = 4$$

$$\ln(e^{2x}) = \ln(4)$$

$$2x = \ln 4$$

$$x = \frac{\ln 4}{2}$$

$$= \frac{\ln 2^2}{2} = \frac{2 \ln 2}{2} = \underline{\underline{\ln 2}}$$

③

Example: $\log_2(x+3) = 4$

~~Take both sides~~

Take 2 to the power of both sides:

$$2^{\log_2(x+3)} = 2^4$$

$$x+3 = 2^4$$

$$x = 2^4 - 3$$

$$= 16 - 3 = 13 //$$

Note: In general:

$$\left. \begin{array}{l} b^{\log_b(x)} = x \\ b^{\log_b(y)} = y \\ \log_b(b^y) = y \end{array} \right\}$$

Example: $\ln(3e^{2x}) = 4$

4.

$$\ln(3e^{2x}) = 4.$$

$\ln(3e^{2x})$

rule (1)

$$\ln 3 + \ln(e^{2x}) = 4.$$

$$\ln(e^{2x}) = 4 - \ln 3.$$

$$2x = 4 - \ln 3.$$

$$x = \frac{4 - \ln 3}{2}$$

$$\ln(3e^{2x}) = 4$$
$$e^{\ln(3e^{2x})} = e^4$$

$$3e^{2x} = e^4$$

$$e^{2x} = \frac{e^4}{3}$$

$$\ln(e^{2x}) = \ln\left(\frac{e^4}{3}\right)$$

$$2x = \ln\left(\frac{e^4}{3}\right)$$

$$x = \frac{1}{2} \ln\left(\frac{e^4}{3}\right)$$
$$= \frac{1}{2} (\ln e^4 - \ln 3)$$
$$= \frac{1}{2} (4 - \ln 3)$$