

Differentiation exponential and log functions

$$\frac{d}{dx}(e^x) = e^x$$

$$\frac{d}{dx}(e^{kx}) = ke^{kx}$$

$$\frac{d}{dx}(\ln x) = \frac{1}{x}$$

$$\frac{d}{dx}(a^x) = a^x \ln a$$

$$\frac{d}{dx}(a^{kx}) = a^{kx} k \ln a$$

Quickfire Questions

$$\frac{d}{dx}(3^x) =$$

$$\frac{d}{dx}(x^3) =$$

$$\frac{d}{dx}(\ln(3x)) =$$

$$\frac{d}{dx}(3^{2x}) =$$

$$\frac{d}{dx}(2^{3x}) =$$

$$\frac{d}{dx}(5 \ln x) =$$

$$\frac{d}{dx}\left(e^{\frac{1}{2}x}\right) =$$

$$\frac{d}{dx}(5 \ln(2x)) =$$

$$\frac{d}{dt}(9^t) =$$

$$\frac{d}{dx}(5(4^x)) =$$

$$\frac{d}{dx}(x^4) =$$

$$\frac{d}{dx}(\ln 6x) =$$

$$\frac{d}{dx}(6 \ln x) =$$

$$\frac{d}{dx}(3e^{2x}) =$$

$$\frac{d}{dx}(e^{-x}) =$$

'Meatier' Example:

A rabbit population P after t years can be modelled using $P = 1000(2^t)$. Determine after how many years the rate of population increase will reach 20,000 rabbits per year.

Test Your Understanding

1. Differentiate $y = (e^x + 2)^2$ (Hint: Expand first)

2. A child has headlice and his parents treat it using a special shampoo. The population P of headlice after t days can be modelled using $P = 460(3^{-2t})$

a) Determine how many days have elapsed before the child has 20 headlice left.

b) Determine the rate of change of headlice after 3 days.