## 3.9 part 1: Derivatives of Exponential Functions

Derivative of  $y = e^x$ 

Find the derivative of

$$f(x) = b^x$$

 $f(x) = b^x$  b being the base of the exponent x

Using the definition of the derivative

## Example 1

Find the derivative of each function:

a) 
$$y = e^{3x}$$

b) 
$$y = e^{\frac{x}{3}}$$

c) 
$$y = e^{\sqrt{x}}$$

d) 
$$y = e^{\sin x}$$

$$f) y = e^{\tan^{-1} x}$$

g) 
$$y = xe^x$$

h.) 
$$y = x^2 e^x$$

## Example 2 How Fast does a Flu Spread?

The spread of a flu in a certain school is modeled by the equation

$$P(t) = \frac{100}{1 + e^{3 - t}}$$

where P(t) is the total number of students infected t days after the flu was first noticed.

a) Sketch a graph the function P(t)

b) Estimate the initial number of students infected with the flu.

c) How fast was the flu spreading after 3 days?

d) Graph the derivative; when will the flu spread at its maximum rate? What is this rate?