## 3.9 part 1: Derivatives of Exponential Functions

## Derivative of $y=e^{x}$

Find the derivative of

$$
f(x)=b^{x} \quad b \text { being the base of the exponent } x
$$

Using the definition of the derivative

## Example 1

Find the derivative of each function:
a) $y=e^{3 x}$
b) $y=e^{\frac{x}{3}}$
c) $y=e^{\sqrt{x}}$
d) $y=e^{\sin x}$
f) $y=e^{\tan ^{-1} x}$
g) $y=x e^{x}$
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?

