

## Derivatives of Exponentials

## Part 1: Derivatives of Exponentials

If  $f(x) = e^x$ , then  $f'(x) = e^x$ .

**Example 1:** Find the derivatives of the following:

a.)  $y = 7e^x - 2x^4 + 5$

$$y' = 7e^x - 8x^3$$

b.)  $f(x) = 3x^2 e^x$

$$f'(x) = 6x e^x + 3x^2 e^x$$

c.)  $g(x) = \frac{e^x}{(3x^2 - 7)^5}$

$$= \frac{e^x (3x^2 - 7)^5 - 5(3x^2 - 7)^4 \cdot 6x e^x}{[(3x^2 - 7)^5]^2}$$

If  $f(x) = e^{u(x)}$ , then  $f'(x) = u'(x) \cdot e^{u(x)}$  (the chain rule)

**Example 2:** Find the derivatives of the following:

a.)  $y = e^{7x^5}$

$$\Rightarrow y' = 35x^4 e^{7x^5}$$

b.)  $f(x) = 4x^2 e^{3x^7-2}$

$$\Rightarrow f'(x) = 8x e^{3x^7-2} + 4x^2 e^{3x^7-2} \cdot 21x^6$$

c.)  $z = \ln(e^{x^3}) = x^3$

$$z' = 3x^2$$