

1. Use proper notation. Use the basic derivative rules we have developed to find the derivatives of

a)  $f(x) = 6x^8 + \frac{x^{-12}}{2} - 7 = 6x^8 + \frac{1}{2}x^{-12} - 7$

So  $f'(x) = 48x^7 - 6x^{-13}$

b)  $g(x) = 9x^{12/5} + 9x^{-12/5} + \pi$

$g'(x) = \frac{108}{5}x^{7/5} - \frac{108}{5}x^{-17/5}$

c)  $s(t) = 2t^{-3/5} - \frac{e^t}{4} = 2t^{-3/5} - \frac{1}{4}e^t$

$s'(t) = -\frac{6}{5}t^{-8/5} - \frac{1}{4}e^t$

d)  $s(x) = \frac{5e^x}{2} - 3\sqrt[7]{x^4}$  (first rewrite in exponent form)

$s(x) = \frac{5}{2}e^x - 3x^{4/7}$

$s'(x) = \frac{5}{2}e^x - \frac{12}{7}x^{-3/7}$

e)  $q(x) = 6\sqrt{x} - 2e^x + 7 = 6x^{1/2} - 2e^x + 7$

$q'(x) = 3x^{-1/2} - 2e^x$

f)  $g(w) = \frac{1}{4\sqrt[3]{w^5}}$  (first rewrite in exponent form)

$g(w) = \frac{1}{4}w^{5/3}$

$g'(w) = -\frac{5}{12}w^{-8/3}$

g)  $f(t) = \frac{4}{t^8} - 3e^t + t = 4t^{-8} - 3e^t + t$

$f'(t) = -32t^{-9} - 3e^t + 1$

h) Suppose in the previous part the function  $f(t)$  represents the position of an object at time  $t$ . What is the instantaneous velocity at time  $t = 1$ ?

$f'(1) = -32 - 3e + 1$

$= -31 - 3e$

Inst Vel =  $f'(t)$

2. Compute and compare the derivatives of

a)  $r(x) = \frac{1}{5x^{11}} = \frac{1}{5}x^{-11}$

$r'(x) = -\frac{11}{5}x^{-12}$

b)  $s(x) = \frac{5}{x^{11}} = 5x^{-11}$

$s'(x) = -55x^{-12}$

c) Were they the same? (They should not be!)

4. a) **Close Reading:** In Section 3.3, the authors state what they believe is a **remarkable fact** about the exponential function. What is it?

The derivative of  $e^x$  is itself!

- b) **Close Reading:** Read ahead in Section 3.4. The authors use a 'useful tactic' in the proof of the product rule. Explain what the tactic is.

They add 0 in the form  $-f(x)g(x+h) + f(x)g(x+h)$   
to the numerator of the difference quotient  
See p 154

5. a) Do page 151 #28. Read the instructions first!

$$h(x) = \sqrt{x}(\sqrt{x} - 1) = x - \sqrt{x} = x - x^{1/2}$$

$$\text{So } h'(x) = 1 - \frac{1}{2}x^{-1/2}$$

- b) Do page 151 #30.

$$y = \frac{12s^3 - 8s^2 + 12s}{4s} = 3s^2 - 2s + 3 \quad (s \neq 0)$$

$$y' = 6s - 2 \quad (s \neq 0)$$

- c) Do page 151 #38.

$$y = \frac{e^x}{4} - x; a=0 \leftarrow \text{Tangent line}$$

$$y = \frac{1}{4}e^x - x \quad \text{So } y' = \frac{1}{4}e^x - 1$$

For Tangent Line at  $a=0$

means you need the equation of a line

$$\text{slope} = y'(0) = \frac{1}{4}e^0 - 1 = \frac{1}{4} - 1 = -\frac{3}{4}$$

$$\text{pt} = (0, y(0)) = (0, \frac{1}{4})$$

$$\begin{aligned} \text{Equ: } y - \frac{1}{4} &= -\frac{3}{4}(x - 0) \\ y &= -\frac{3}{4}x + \frac{1}{4} \end{aligned}$$