Higher Order Derivatives

From Physics:

$s(t)$ position function [sometimes called $x(t)$]

$s'(t) = v(t)$ velocity function

$s''(t) = a(t)$ acceleration function

$s'''(t) = j(t)$ jerk or impluse

SAY "S DOUBLE PRIME"

In general:

y' first derivative

y'' second derivative

PLEASE WRITE DOWN

The second derivative can also be written as $\frac{d^2y}{dx^2}$

y''' third derivative

$y^{(4)}$ fourth derivative

$y^{(n)}$ n^{th} derivative

$y^{(4)}$

See page 129 #116

Given: $v(t) = \dfrac{100t}{2t+15}$ in $\dfrac{ft}{\sec}$

Find: $a(5)$, $a(10)$, $a(20)$

We'll need to find $a(t)$ first.

$a(t) = s''(t)$

$a(t) = v'(t)$

$$a(t) = \frac{d}{dt}\left(\frac{100t}{2t+15}\right)$$

What rule will we need? What units will we use?

QUOTIENT

ft/sec^2

$$a(t) = \frac{(2t+15)(100) - (100t)(2)}{(2t+15)^2}$$

$$= \frac{200t + 1500 - 200t}{(2t+15)^2}$$

$$a(t) = \frac{1500}{(2t+15)^2}$$

t	$a(t)$ ft/sec^2
5	$\frac{1500}{(10+15)^2}$
10	$\frac{1500}{(20+15)^2}$
20	$\frac{1500}{(40+15)^2}$

Let $f(x) = 4\cos x$. Find $f''(x)$

$f'(x) = -4\sin x$

$f''(x) = -4\cos x$

$f'''(x) = 4\sin x$

$f^{(4)}(x) = 4\cos x$

Let $g(x) = \csc x$. Find $g''(x)$

$g'(x) = -\csc x \cot x$

$g''(x) = \csc x \cot x \cot x + (-\csc^2 x)(-\csc x)$

$= \quad$ ——— 3

Let $h(x) = \dfrac{2x^3 - 3x + 1}{x}$. Find $h''(x)$

SIMPLIFY FIRST

$h(x) = 2x^2 - 3 + x^{-1}$

$h'(x) = 4x - x^{-2}$

$h''(x) = 4 + 2x^{-3}$

To be done after quiz on Tuesday
Homework: page 128 #94-102 evens