Higher Order Derivatives

$f(x)$	y		
$f'(x)$	$\frac{dy}{dx}$	$\rightarrow$ f inc/decr	vel
$f''(x)$	$\frac{d^2y}{dx^2}$	$\rightarrow$ CU/CD	accel
$f'''(x)$	$\frac{d^3y}{dx^3}$		jerk
$f^4(x)$			pounce

$f(x) = x^3 - 3x^2 + 5x - 1$

$f'(x) = 3x^2 - 6x + 5$

$f''(x) = 6x - 6$

$f'''(x) = 6$

$f^4(4) = 0$

n th degree poly

$(n+1)$th deriv $= 0$

$15x - 3 - 15x - 6$

$$f(x) = \frac{3x+2}{5x-1}$$

$$f'(x) = \frac{3(5x-1) - 5(3x+2)}{(5x-1)^2}$$

$$= -\frac{9}{(5x-1)^2}$$

$$= -9(5x-1)^{-2}$$

$$f''(x) = 18(5x-1)^{-3}(5) = \frac{90}{(5x-1)^3}$$

$$f(x) = \sec x$$

$$f'(x) = \sec x \tan x$$

$$f''(x) = \sec x \sec^2 x + \tan x \sec x \tan x$$

$$= \sec x \left(\sec^2 x + \tan^2 x \right)$$

$$f'''(x) = (\sec x)(2 \sec x \sec x \tan x + 2 \tan x \sec^2 x)$$

$$+ \text{etc.}$$

$f(x) = \sin x$

$f'(x) = \cos x$

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

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

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

$f(x) = \cos x$

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

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

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

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

Given $f(x) = \sin x$, find $f^{555}(x)$.

$$\begin{array}{r} 138 \text{ R } 3 \\ 4\overline{)\,5\,{}^{1}5\,{}^{3}5} \end{array}$$

$$f^{555}(x) = f'''(x)$$

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

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

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

$$\therefore f^{555}(x) = -\cos x$$