Higher Order Derivatives

$f(x)$	y	
$f'(x)$	$\frac{dy}{dx}$	$\longrightarrow$ inst rate of change in func. val. (vel) f↑ f↓
$f''(x)$	$\frac{d^2y}{dx^2}$	$\longrightarrow$ CU/CD (accel)
$f'''(x)$	$\frac{d^3y}{dx^3}$	(jerk)
$f^4(x)$		(pounce)

$f(x) = x^3 + 6x^2 + 5x - 4$

$f'(x) = 3x^2 + 12x + 5$

$f''(x) = 6x + 12$

$f'''(x) = 6$

$f^4(4) = 0$

poly funct.

n th deg poly

(n+1)th deriv = 0

$f(x) = \sec x$

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

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

$= \sec^3 x + \sec x \tan^2 x$

$6x-2-6x-3$

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

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

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

$$=-5(3x-1)^{-2}$$

$$f''(x)=10(3x-1)^{-3}(3)$$

$$=\frac{30}{(3x-1)^3}$$

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

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

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

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

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

Given $f(x) = \sin x$ find $f^{523}(x)$.

$$\begin{array}{r} 130\text{ R}3 \\ 4\overline{)\,523} \end{array}$$

$$f^{523}(x) = f'''(x)$$

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

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

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

$$\therefore f^{523}(x) = -\cos x$$

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

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

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

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

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