Thursday, June 18, 2009
7:11 AM

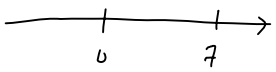
55/§3.4/pg 184 $f(x) = x^3 - 9x^2 + 15x$ ← x in seconds
f(x) gives position in feet

$f(0) = 0$ ft

$f(1) = 1 - 9 + 15 = 7$ ft

Velocity = inst. rate of change of position

$= f'(x) = 3x^2 - 18x + 15$ ft/sec



$f'(0) = 15$ ft/sec , $f'(3) = 3(3)^2 - 18(3) + 15 = -12$ ft/sec

(leftward at 12 ft/sec)

where is velocity 0?

$f'(x) = 0$?

$3x^2 - 18x + 15 = 0$

$3(x^2 - 6x + 5) = 0$

$3(x-5)(x-1) = 0$

$x = 5$ sec or $x = 1$ sec

Ex. $f(x) = ax^2 + bx + c$ ←

3.4/65

$f'(x) = 2ax + b = 0$

$2ax = -b$

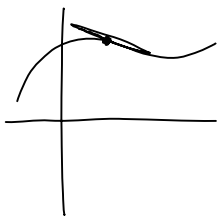
$x = \frac{-b}{2a}$

35/37 $f(x) = \frac{x-8}{3x-4}$ tangent line at $(2, f(2))$

$f(2) = \frac{2-8}{3(2)-4} = \frac{-6}{2} = -3$

$y - y_0 = m(x - x_0)$

$f(2) = -3$, $f'(2) = 5$, $x = 2$



$f'(x) = \frac{(3x-4)(1) - (x-8)(3)}{(3x-4)^2}$, $f'(2) = \frac{(3(2)-4) - (2-8)(3)}{(3\cdot 2-4)^2}$

$= \frac{2+18}{4} = 5$

$y - \cancel{(-1)} = 5(x-2)$

$y \cancel{+1} = 5x - 10$

$y = 5x \cancel{-11} - 13$

#42 pg 192 $f'(x) = 0$ for $f(x) = \frac{x}{x^2+9}$

$f'(x) = \frac{(x^2+9)(1) - x(2x)}{(x^2+9)^2} = \frac{x^2+9-2x^2}{(x^2+9)^2} = \frac{9-x^2}{(x^2+9)^2} = 0$

(Lo Dhi − Hi Dlo / Lo²)

whenever $9 - x^2 = 0$ ok

$(3-x)(3+x) = 0$

$x = 3$ or $x = -3$

$9 = x^2$

$x = \pm 3$

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§3.6 Chain Rule $f(x) = \sqrt{3x+5}$

└ used to differentiate chains of functions

$\frac{d}{dx}\,\text{out}(\text{in}(x)) = \text{out}'(\text{in}(x)) \cdot \text{in}'(x)$

$\frac{d}{dx} f(g(x)) = f'(g(x))\, g'(x)$

ex. $\frac{d}{dx}\sqrt{3x+5} = \frac{d}{dx}(3x+5)^{1/2} = \frac{1}{2}(3x+5)^{-1/2} \cdot 3$

(out, in; out'(in(x)), in'(x))

$= \frac{3}{2} \cdot \frac{1}{\sqrt{3x+5}}$

ex. $h(t) = (t^3 - 3t^2 + 5t + 12)^4$

$h'(t) = 4(t^3 - 3t^2 + 5t + 12)^3 (3t^2 - 6t + 5)$

ex. $f(x) = (3x-5)^4 \cdot (2x+7)^5$

$f'(x) = (3x-5)^4 \frac{d}{dx}(2x+7)^5 + \left(\frac{d}{dx}(3x-5)^4\right)(2x+7)^5$ (PR)

$= (3x-5)^4 \underbrace{5(2x+7)^4(2)}_{\text{CR}} + \underbrace{4(3x-5)^3(3)}_{\text{CR}}(2x+7)^5$

$= (3x-5)^3 (2x+7)^4 2 [\, 5(3x-5) + 6(2x+7) \,]$

$= 2(3x-5)^3 (2x+7)^4 [33x + 17]$

HW → §3.6