hw solutions
section 3.5

7. find f' & f''. $f(x) = (x^2+2)^5$

$f'(x) = 5(x^2+2)^4 \cdot 2x = 10x(x^2+2)^4$

$f''(x) = 10(x^2+2)^4 + 10x \cdot 4(x^2+2)^3(2x)$

$= 10(x^2+2)^4 + 80x^2(x^2+2)^3$

OR $= 10(x^2+2)^3(x^2+2+8x^2)$

$= 10(x^2+2)^3(9x^2+2)$

22. $f(x) = 3x^5 - 6x^4 + 2x^2 - 8x + 12$
find f'''!

$f'(x) = 15x^4 - 24x^3 + 4x - 8$

$f''(x) = 60x^3 - 72x^2 + 4$

$f'''(x) = 180x^2 - 144x$

29. distance falls: $s = 16t^2$
initial height: 256 ft
find the vel & acc. of hammer when it hits the ground.

time when hits ground:

$256 = s = 16t^2$

$16 = t^2$

$4 = t$ ← no neg. time

velocity:

$v(t) = s'(t) = 32t$

$v(4) = 32 \cdot 4 = 128$ ft/sec

accel:

$a(t) = v'(t) = 32$

$a(4) = 32$ ft/sec^2

16. find g' & g''. $g(t) = \dfrac{t^2}{t-1}$

way 1: $g'(t) = \dfrac{2t(t-1) - t^2}{(t-1)^2} = \dfrac{t^2-2t}{(t-1)^2}$

$g''(t) = \dfrac{(2t-2)(t-1)^2 - (t^2-2t)\cdot 2(t-1)}{(t-1)^4}$

$= \dfrac{2(t-1)^2 - 2(t^2-2t)}{(t-1)^3} = \dfrac{2t^2-4t+2-2t^2+4t}{(t-1)^3}$

$= \dfrac{2}{(t-1)^3}$

way 2:

$g(t) = \dfrac{t^2}{t-1} = \dfrac{t^2-t+t}{t-1} = \dfrac{t^2-t}{t-1} + \dfrac{t}{t-1} = t + \dfrac{t}{t-1}$

$g'(t) = 1 + \dfrac{1(t-1) - t(1)}{(t-1)^2} = 1 - \dfrac{1}{(t-1)^2} = 1 - (t-1)^{-2}$

$g''(t) = 2(t-1)^{-3} = \dfrac{2}{(t-1)^3}$

37. $f(t) = 10.72(.9t+10)^{.3}$, $0 \le t \le 20$

$t = 0 \Rightarrow 2000$.

Compute $f''(10)$ & interpret.

$t = 10 \Rightarrow 2010$

$f'(t) = 3.216(.9t+10)^{-.7}(.9)$

$= 2.8944(.9t+10)^{-.7}$

$f''(t) = -2.02608(.9t+10)^{-1.7}(.9)$

$= -1.823472(.9t+10)^{-1.7}$

$f''(10) = -.0122$ %/yr^2

means: the rate of change of the % of older Americans decreases at a rate of .0122%/yr^2.