Name: Mr. Konichek Quiz 3: Ch 3.5

Draw a box around your final answers. No partial credit will be given.

Find the 2nd derivative of:

Tx BK Pg 218 #1

1. $f(x) = 4x^2 - 2x + 1$

$f'(x) = 8x - 2$

$\boxed{f''(x) = 8}$

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

#3

$f'(x) = 8x^2 - 6x$

$f''(x) = 16x - 6 = \boxed{2(8x-3)}$

3. $h(t) = t^4 - 2t^3 + 6t^2 - 3t + 10$

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

#5

$h''(t) = 12t^2 - 12t + 12 = \boxed{12(t^2 - t + 1)}$

4. $f(x) = (x^2 + 2)^5$ **[2 lines]**

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

#7

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

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

$f''(x) = 10(x^2+2)^3\left[(x^2+2) + 8x^2\right]$

$9x^2+2$

$\boxed{f''(x) = 10(x^2+2)^3(9x^2+2)}$

5. $g(t) = (2t^2 - 1)^2(3t^2)$ **[2 lines]**

#9

$g'(t) = (3t^2)(2)(2t^2-1)(4t) + (2t^2-1)(6t)$

$= 24t^3(2t^2-1) + (2t^2-1)(6t)$

$= (2t^2-1)(24t^3+6t)$

$6(12t^2+1)$

$g''(t) = (24t^3+6t)(4t) + (2t^2-1)(72t^2+6)$

$= \boxed{6t(4t^2+1) + 6(2t^2-1)(12t^2+1)}$

Find the 2nd derivative of:

#15 6. $f(x)=\dfrac{x}{2x+1}$ **[2 lines]**

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

$2x+1-2x$ $\quad 1$

$$f''(x)=-2(2x+1)^{-3}(2)=\boxed{\frac{-4}{(2x+1)^3}}$$

note not in hmwk #8

7. $f(x)=x^2(3x+1)^4$ **[2 lines]**

$$f'(x)=(3x+1)^4(2x)+(x^2)(4)(3x+1)^3(3)$$

$$=2x(3x+1)^4+12x^2(3x+1)^3$$

$$=\cancel{2x(3x+1)^3}\,(3x+1)^3\left(2x(3x+1)+12x^2\right)$$

$6x^2+2x+12x^2$ $\quad 18x^2+2x$

$$=(3x+1)^3(18x^2+2x)$$

$$f''(x)=(18x^2+2x)(3)(3x+1)^2(3)+(3x+1)^3(36x+2)$$

$$=18x(9x+1)(3x+1)^2+2(3x+1)^3(18x+1)$$

$$2(3x+1)^2\left[9x(9x+1)+2(3x+1)(18x+1)\right]$$

$81x^2+9x+108x^2+42x+2$

$189x^2+51x+2$

final answer #7 $\boxed{2(3x+1)^2(189x^2+51x+2)}$

#21 8. Find the 3rd derivative of: $f(x)=3x^4-4x^3$

$$f'(x)=12x^3-12x^2$$

$$f''(x)=36x^2-24x$$

$$f'''(x)=72x-24$$

$$\boxed{f'''(x)=24(3x-1)}$$

#22

9. Find the 3rd derivative of: $f(x) = 3x^5 - 6x^4 + 2x^2 - 8x + 12$

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

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

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

$f'''(x) = 6x(30x - 24) = \boxed{36x(5x-4)}$

like #29

10. During the construction of an office building, a hammer is accidentally dropped from a height of $108\ ft$. The distance (in feet) the hammer falls in t seconds is $s = 12t^2$.

a. What is the hammer's velocity when it strikes the ground?

$12t^2 = 108$

$t^2 = 9$

$t = 3$ seconds

$s' = 24t$

$s'(3) = 24(3) = \boxed{72\ \frac{ft}{s}}$

b. What is its acceleration?

$s'' = 24$

$24\ \frac{ft}{s^2}$

Note:
But as a physist
I know the acceleration of gravity is $32\ ft/s^2$
so the textbook problem is accurate
This problem is another planet.