Homework 2/26

For the first four problems, $f$, $g$ and $h$ are functions of $x$. In those problems, find $dy/dx$.

1. (a) $y = x^4$
   (b) $y = f^4$
   (c) $y = f(x^4)$

2. (a) $y = \tan x$
   (b) $y = \tan(f(x))$
   (c) $y = f(\tan x)$

3. (a) $y = x^4(\sin x + \cos x)$
   (b) $y = x^4(f + g)$
   (c) $y = x^4f + g$
   (d) $y = x^4fg$
   (e) $y = \frac{x^4}{fg}$

4. (a) $y = f^4g^3$
   (b) $y = \frac{f^2 - g^2}{h}$
   (c) $y = x^2f(x^2)$

5. Section 3.5: 73, 75, 76, 79a, 111.

6. Section 3.5: 112. Rephrase the problem as, “Compute the acceleration at time $t$. Simplify until the answer is expressed in terms of $k$.” Note that both $s$ and $v$ in this problem are functions of time, $t$.

7. Section 3.5: 113. Rephrase the problem as, “Compute the acceleration at time $t$. Simplify until the answer is expressed in terms of $k$ and $s$.”
Hints and Answers

1. a) $4x^3$; b) $4f^3 f'$; c) $4x^3 f'(x^4)$.

2. a) $\sec^2 x$; b) $\sec^2 (f(x)) f'(x)$; c) $f'(\tan x) \sec^2 x$.

3. a) $4x^3(\sin x + \cos x) + x^4(\cos x - \sin x)$; b) $4x^3(f + g) + x^4(f' + g')$; c) $4x^3 f + x^4 f' + g'$
   
   d) $4x^3 f g + x^4(f' g + f g')$; e) $\frac{4x^3 f g - x^4(f' g + f g')}{(f g)^2}$.

4. a) $4f^3 f' g^3 + 3g^2 g' f^4$; b) $\frac{(2ff' - 2gg')h - (f^2 - g^2)h'}{h^2}$; c) $2xf(x^2) + 2x^3 f'(x^2)$.

5. Problem 76 is 3.

6. Hint: $s' = v$, and $v = k\sqrt{s}$.

7. $a = -\frac{k^2}{2s^2}$