Spring 2012 Math 151

Week in Review # 5
sections: 3.5, 3.6, 3.7
courtesy: Joe Kahlig

Section 3.5

Problems 1-8: Find the derivative of these functions.

1. $f(x) = (4 - 3x^2)^4$

2. $f(x) = \tan\sqrt{x}$

3. $f(x) = x^2\sqrt{2x^3 + 1}$

4. $f(t) = \sin^3(2t - 1)$

5. $f(x) = x^2\sec(5 - 4x^4)$

6. $y = \left(\dfrac{x^3 + 5}{x^4 + 7}\right)^4$

7. $h(x) = \dfrac{2}{\sqrt{x^3 + 5}}$

8. $y = (x^2 + 1)^4(6 - 2x)^3$

9. Find the equation of the tangent line to the graph of $y = 5x^2(4 - x)^3$ at $x = 2$

Problems 10-12 refer to the functions f and g that satisfy the properties as shown in the table. Find the indicated quantity.

x	$f(x)$	$f'(x)$	$g(x)$	$g'(x)$
0	1	-3	3	5
1	2	6	7	11
2	-5	0	2	10
3	4	-1	-4	8

10. $H'(0)$ if $H(x) = f(g(x))$

11. $J'(\sqrt{3})$ if $J(x) = f(x^2)$

12. $K'(1)$ if $K(x) = \left(x^2 + g(3x)\right)^3$

Section 3.6

10. Find $\dfrac{dy}{dx}$ if $x^4 - 4x^2y^2 + y^3 = 0$

11. Find $\dfrac{dy}{dx}$ if $\sqrt{x^2 + y^2} = 3$

12. Find $\dfrac{dx}{dy}$ if $x\sin(y) + \cos(2x) = \cos(y^2)$

13. Find $\dfrac{dx}{dy}$ if $4x = \dfrac{3 + y^3}{y^2 + x}$

14. Find the equation of the line tangent to $x^{\frac{1}{3}} + y^{\frac{1}{3}} = 3$ at $(1,8)$.

Section 3.7

15. Find the unit tangent vector to the curve
    $\mathbf{r} = (t^2)\mathbf{i} + (3t^3)\mathbf{j}$ at the point $(1, -3)$

16. Find a vector and a parametric equations of the line tangent to $\mathbf{r} = (t^3 + 2t)\mathbf{i} + (4t - 5)\mathbf{j}$ at the point where $t = 2$

17. The curve $\mathbf{r} = (\sin 2t)\mathbf{i} + (\cos t)\mathbf{j}, 0 \leq t \leq 2\pi$ crosses itself at the origin. Find the angle between the tangent vectors at this point.

18. A cannonball fired fired from a cannon has a position function given by $\mathbf{r} = (5t)\mathbf{i} + (36t - 2t^2)\mathbf{j}$, where distance is measured in feet and time is measured in seconds.

    (a) Compute the velocity and speed of the cannon ball at $t = 3$.
    (b) With what speed does the cannon ball hit the ground?