Fall 2007 Math 151

Week in Review 4

courtesy: Amy Austin

(covering sections 3.4 - 3.9)

Section 3.4

1. Find the limit. Support your answer.

   a.) $\lim_{x\to 0} \dfrac{\sin 7x}{2x}$

   b.) $\lim_{x\to 0} \dfrac{\tan^2(5x)}{3x^2}$

   c.) $\lim_{x\to 0} \dfrac{\cos x - 1}{\sin(3x)}$

2. Find the derivative of $f(x) = \sec x \tan x$

3. Find the derivative of $h(x) = \dfrac{\cot x}{\sin x}$

4. Find the tangent line to the graph of $f(x) = \sec^2 x$ at $x = \dfrac{\pi}{4}$

Section 3.5

5. Suppose that $w = u \circ v$, $u(0) = 1$, $v(0) = 2$, $u'(0) = 3$, $u'(2) = 4$, $v'(0) = 5$ and $v'(2) = 6$. Find $w'(0)$.

6. Find $f'(x)$ if $f(x) = \tan(x^5)$

7. Find $f'(x)$ for $f(x) = \sin^3 4x$

8. Find the tangent line to the graph of $f(x) = \dfrac{8}{\sqrt{4+3x}}$ at $x = 0$.

9. Find $f'(x)$ for $f(x) = (x^2+1)^4(2-3x)^3$

10. If $G(x) = \cos(f(x)) + f(\cos x)$, find $G'(x)$.

11. Find the derivative of $f(x) = \sqrt{1+\sqrt{1+\sqrt{x}}}$.

12. Find y' for $y = \sec(\sec(\sec(x)))$.

Section 3.6

13. Find $\dfrac{dy}{dx}$ if $y^5 + 2x^2y^3 = 6x^2 - y^2 + 5$.

14. Find $\dfrac{dy}{dx}$ for $\cos(x-2y) = x^3y^3 + 1$

15. Find the tangent line to the graph of $y^2 = x^3(2-x)$ at the point $(1,1)$.

16. Show the curves $x^2 - y^2 = 5$ and $4x^2 + 9y^2 = 72$ are orthogonal at the point $(3,2)$

Section 3.7

17. Find the tangent vector to the curve

    $\mathbf{r}(\mathbf{t}) = \langle 2t, 3t^3 \rangle$ at $t = -1$.

18. A cannonball fired from a cannon has a position function given by

    $\mathbf{r}(\mathbf{t}) = \langle 5t, 36t - 2t^2 \rangle$.

    a.) Compute the velocity and the speed of the cannonball at time $t = 4$.

    b.) With what speed does the cannonball hit the ground?

    c.) How far does the cannonball travel before hitting the ground?

19. Given $\mathbf{r}(\mathbf{t}) = \langle 2\cos t, 3\sin t \rangle$:

    a.) Sketch the curve by eliminating the parameter.

    b.) Find the position and tangent (velocity), vector to the curve at $t = \dfrac{\pi}{3}$.

    c.) Find parametric equations for the tangent line to the curve $\mathbf{r}(\mathbf{t})$ at $t = \dfrac{\pi}{3}$.

Section 3.8

20. Find y'' for $y = \sqrt{x^2+1}$.

21. If $\mathbf{r}(\mathbf{t}) = \langle t^3, t^2 \rangle$ represents the position of a particle at time t, find the angle between the velocity and the acceleration vector at time $t = 1$.

Section 3.9

22. Given $x = \cos t$ and $y = t^2$, find the equation of the tangent line at $t = \dfrac{\pi}{4}$.

23. Let $x = t^4 - 4t^3$ and $y = 3t^2 - 6t$.

    a.) Find the equation of the tangent line at the point $(5,9)$.

    b.) Find all point(s) on the curve where the tangent line is vertical or horizontal.