

Math 151 Week in Review Week 6 sections 3.4-3.9

3.4

1. Evaluate each limit.

a) $\lim_{x \rightarrow 0} \frac{2x^2}{\sin^2 x}$ b) $\lim_{x \rightarrow 0} \frac{\sin^2 x}{\sin 2x \sin 3x}$ c) $\lim_{x \rightarrow 0} \frac{\tan 4x}{\tan 5x}$

2. Find the equation of the tangent line to f at $(a, f(a))$.

a) $f(x) = \sec x \tan x$ $a = \pi/3$

b) $f(x) = \sin x - \cos x$ $a = \pi/2$

c) $f(x) = \tan x$ $a = \pi/6$

3.5

3. Find the derivative of $f(x)$.

a) $f(x) = \sqrt{\sin^2 x + 1}$

b) $f(x) = \tan 3x^2 + 1$

c) $f(x) = (\sec^2 x + 1)^3$

4. $f(u) = u^2 + 5$ u is a function of x so that $u(1) = 3$ and $u'(1) = -2$.

Find $\frac{df}{dx}$ at the point where x is equal to 1.

3.6

5. Find x' if $(x^2 + y^2)^2 = ax^2y$. (from Stewart)

6. Find the tangent line at the point $(3, 1)$ to the curve described by $xy^3 + xy = 6$. (from Stewart)

7. Show that the curves $x^2 + y^2 = 5x$ and $x^2 + y^2 = 10y$ are orthogonal where they intersect.

3.7

8. Find the derivative of $\mathbf{r}(t) = t \sec(t) \mathbf{i} + \tan(t) \mathbf{j}$

9. a) At what point do the curves traced by $\mathbf{r}_1(t) = \langle 1 - t, 3 + t^2 \rangle$ and $\mathbf{r}_2(s) = \langle s - 2, s^2 \rangle$ intersect? Find their angle of intersection. (Stewart, #20 pg 203)

b) Find a tangent vector of unit length at $t = \pi/4$ to $\mathbf{r}(t) = \langle t \cos t, t \sin t \rangle$

3.8

1. a) Find $\frac{d^{83}}{dx^{83}} \sin x$ b) $\frac{d^{125}}{dx^{125}} \cos x$

2. Given the position vector of an object is $\mathbf{r}(t) = \langle t \cos t, t \sin t \rangle$, find the acceleration vector.

3.9

1. Find a unit normal vector to the line parameterized by $x = 1 - t$, $y = 2 + 3t$

2. Find the points on the curve where the tangent is horizontal or vertical.

a) $x = t^3 - 3t^2$ $y = t^3 - 3t$ (#12, Stewart section 3.9)

b) $x = a(\cos t - \cos^2 t)$ $y = a(\sin t - \sin t \cos t)$ (#16, Stewart section 3.9)