

Spring 2012 Math 151

Week in Review # 6

sections: 3.8, 3.9, 3.10

courtesy: Joe Kahlig

Section 3.8

1. Find y'' for $y = \sqrt{x^2 + 1}$
2. Find y' , y'' , and y''' for $y = \frac{x^2}{x + 1}$
3. The function g is a twice differentiable function. Find f'' where $f(x) = xg(x^2)$.
4. Find $D^{25} \cos(4x)$
5. Suppose the position of a particle at time t is given by $\mathbf{r} = (4t^2)\mathbf{i} + (\cos 2t)\mathbf{j}$. Find the acceleration of the particle when $t = \frac{\pi}{4}$
6. Find a second degree polynomial, $p(x)$, such that $p(2) = 4$, $p'(2) = 3$ and $p''(2) = 4$

Section 3.9

7. $x(t) = t^3 - 3t^2 + 5$ and $y(t) = 2t - 7$
 - (a) compute $\frac{dy}{dx}$
 - (b) compute $\left. \frac{dx}{dy} \right|_{t=3}$
 - (c) compute $\left. \frac{dy}{dx} \right|_{(3,-5)}$
8. A curve is given parametrically by $x = t^4 - 4t^3$, $y = 3t^2 - 6t$.
 - (a) Find the equation of the line tangent to the curve at the point $(-16, 0)$
 - (b) Find all the points on the curve where the tangent line is horizontal.
 - (c) Find all the points on the curve where the tangent line is vertical.

Section 3.10

9. The length of a rectangle is increasing at a rate of 1 foot per second, while the width is decreasing at a rate of 2 foot per second. When the length is 10 feet and the width is 8 feet, compute the rate of change of the area of the rectangle?

10. A point moves around the ellipse $4x^2 + 9y^2 = 75$. When the point is at $(\sqrt{3}, \sqrt{7})$, its x coordinate is increasing at a rate of 10 units per second. What is the rate of change of the y coordinate at that instant?

11. You want to fly a kite so that it is 100 ft above the ground and moving horizontally at a speed of 8ft/sec. At what rate should the string be released when 260 feet of string has been let out. Assume that there is no slack in the string.

12. A ladder 15 feet long rests against a vertical wall. If the top of the ladder slides down the wall at a speed of 1.5 feet per second, at what rate of change is the angle between the bottom of the ladder and the ground changing when the angle is $\frac{\pi}{4}$ radians? Assume that the ground is level.

13. A water tank has the shape of an inverted right circular cone of altitude 18ft and a base radius of 6 ft. If water is being pumped into the tank at a rate of 10 gal/min ($\approx 1.337 \text{ ft}^3/\text{min}$), find the rate at which the water level is rising when the water is 5 ft deep.