University of Calgary
Faculty of Science
Department of Mathematics and Statistics

Math 249-L05 Fall 2005

Worksheet 8
[Differentiation and Applications]

1. Determine a point on the curve $y = \sqrt{1 - x^2}$ at which the tangent line will have slope equal to 1.

2. Determine the equation to the tangent line of the curve $x^3 + y^3 = 9$ at the point (2,1).

3. Given the curve $y(y^2 - 1)(y - 2) = x(x - 1)(x - 2)$.
   a. Determine the x-coordinates of the points on the curve where the tangent line is parallel to the x-axis.
   b. Find the equation of the tangent line to the curve at (0,1) and at (0,2).

4. Show that the curves $x^2 - y^2 = 5$ and $4x^2 + 9y^2 = 72$ are orthogonal.

5. Show that $x^2 + y^2 = ax$ and $x^2 + y^2 = by$ are orthogonal families of curves.

6. Consider the curve $\sqrt{x} + \sqrt{y} = \sqrt{c}$. Show that the sum of the x-and y-intercepts of any tangent line to the curve is equal to c.

7. Using implicit differentiation, show that the tangent to the ellipse, $\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$ at the point (x_0, y_0) is given by $\frac{x_0 x}{a^2} + \frac{y_0 y}{b^2} = 1$.

8. Consider the curve $f(x) = x^{\frac{2}{3}}$. Show that $f'(0)$ does not exist.

9. Show that $y = |4x - 1|$ is not differentiable at $\left(\frac{1}{4}, 0\right)$.

10. Exercise 4.1 in your text. Pay special attention to questions 41 - 44.