Implicit Differentiation

a) With respect to x

1. $x^2y + xy^2 = 6$

2. $x^3 - xy + y^3 = 1$

3. $2xy + y^2 = x + y$

4. $x^2(x - y)^2 = x^2 - y^2$

5. $y^2 = \dfrac{x - 1}{x + 1}$

6. $x^2 = \dfrac{x - y}{x + y}$

7. $x = \tan y$

8. $x + \sin y = xy$

b) Find the slope at the given point

1. $y^2 + x^2 = y^4 - 2x$ at $(-2, -1)$

2. $\left(x^2 + y^2\right)^2 = (x - y)^2$ at $(1, -1)$

c) Verify that the point is on the curve and find the equations of the lines that are a) tangent and b) normal (a line perpendicular to a tangent line at the point of tangency) to the original curve.

1. $x^2 + xy - y^2 = 1$, $(2, 3)$

2. $x^2y^2 = 9$, $(-1, 3)$

d) Sketch each of the equations and determine the slope at the given point of the following:

1. the cissoid of Diocies - $y^2(2 - x) = x^3$ at $(1, 1)$

2. the devil's curve - $y^4 - 4y^2 = x^4 - 9x^2$ at $(-3, 2)$