

$$1) x = \cos y$$

$$1 = -\sin y y'$$

$$y' = -\frac{1}{\sin y} = -\csc y$$

$$2) 3x^2 - 5y^2 = 2$$

$$6x - 10y y' = 0$$

$$y' = -\frac{6x}{-10y} = \frac{3x}{5y}$$

$$\frac{d^2y}{dx^2} = \frac{(5y)(3) - (3x)(5y')}{(25y^2)}$$

$$= \frac{15y - 15x\left(\frac{3x}{5y}\right)}{(25y^2)}$$

$$3) y^2 = 9x^2 - 4x$$

$$2y y' = 18x - 4$$

$$y' = \frac{18x - 4}{2y} = \frac{9x - 2}{y}$$

$$y'' = \frac{9y - (9x - 2)y'}{y^2}$$

$$= \frac{9y - (9x - 2)\left(\frac{9x - 2}{y}\right)}{y^2}$$

$$= \frac{9y - \frac{(9x - 2)^2}{y}}{y^2}$$

$$= \frac{9y^2 - (9x - 2)^2}{y^3}$$

$$4) x^2 - 3xy + y^2 = -9$$

$$2x - 3xy' - 3y + 2yy' = 0$$

$$2yy' - 3xy' = 3y - 2x$$

$$y' = \frac{3y - 2x}{2y - 3x}$$

$$5) x^2 + y^2 = 10$$

$$2x + 2yy' = 0$$

$$y' = -\frac{x}{y}$$

$$\left. \frac{dy}{dx} \right|_{(1,3)} = -\frac{1}{3}$$

$$7) xy^2 - 2x = -\frac{1}{2}$$

$$2xyy' + y^2 - 2 = 0$$

$$y' = \frac{2 - y^2}{2xy}$$

$$\left. y' \right|_{\left(\frac{1}{2}, 1\right)} = 1$$

$$6) (x-4)^2 + (y-1)^2 = 8$$

$$2(x-4) + 2(y-1) \cdot y' = 0$$

$$y' = -\frac{(x-4)}{(y-1)}$$

$$\left. y' \right|_{(2,3)} = -\frac{-2}{2} = 1$$

$$8) x^2 + xy - y^2 = 11 \quad (3, 1)$$

$$2x + xy' + y - 2yy' = 0$$

$$e(3, 1) : 6 + 3y' + 1 - 2y' = 0$$

$$y' \Big|_{(3, 1)} = -7$$

$$a) y - 1 = -7(x - 3)$$

$$b) y - 1 = \frac{1}{7}(x - 3)$$

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

$$x^2 \cdot (2yy') + 2xy^2 = 0$$

$$2x^2 yy' + 2xy^2 = 0$$

$$y' = \frac{-xy^2}{x^2 y} = -\frac{y}{x}$$

$$y' \Big|_{(1, -3)} = 3$$

$$a) y + 3 = 3(x - 1)$$

$$b) y + 3 = -\frac{1}{3}(x - 1)$$