Section 3.7 – Implicit Functions

1. Find y' if $4\cos x \cos y = 3y$.

$$\frac{d}{dx}\left(4\cos x\cos y = 3y\right)$$

$$4(-\sin x)\cos y + 4\cos x(-\sin y)y' = 3$$

$$y' = \frac{3 + 4\sin x\cos y}{-4\cos x\sin y}$$

2. Find y' if $e^{xy} + y^2 = 2x$.

apply $\frac{d}{dx}$:

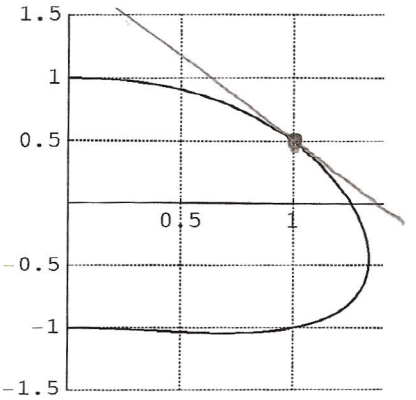
$$(y + xy')e^{xy} + 2yy' = 2$$

$$ye^{xy} + xe^{xy}y' + 2yy' = 2$$

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

3. Find the equation of the tangent line to the curve $x^3 + x^2y + 2y^2 = 2$ at the point (1, 0.5). Then, sketch this line on the diagram to the right.

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



apply $\frac{d}{dx}$

$$3x^2 + 2xy + x^2y' + 4yy' = 0$$

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

$$y' = \frac{-3x^2 - 2xy}{x^2 + 4y}$$

at (1, 0.5)

$$y'(1) = \frac{-3(1)^2 - 2(1)(0.5)}{1^2 + 4(0.5)} = \frac{-3-1}{3} = -\frac{4}{3}$$

Then $y - 0.5 = -\frac{4}{3}(x-1)$; $y = -\frac{4}{3}x + \frac{11}{6}$