

### Implicit Differentiation- Extra Review Questions

1. Find the equation of the tangents to the curve  $x^2 = y^2x + 2$  where  $x=-1$ .  
(Answers: tangent:  $2x-3y-5=0$  and  $3x+2y+5 = 0$  as when  $x=-1, y=1$  OR  $y=-1$ )

2. Find the equation of the tangent to  $y^2 + 2y + 10x + 11 = 0$  which is parallel to  $2y+x=0$ .  
Answer:  $2y+x-7=0$  , slope  $-1/2$ , point  $(9,-11)$

3. If  $x + y = \frac{y}{x} + \frac{x}{y}$  find the slope at the point  $(1,1)$

Answer: -1

4. Find  $\frac{dy}{dx}$  in simplified form:

a)  $x^3y^4 = 3$

b)  $xy + y^3 = x^2 + x + 1$

c)  $y\sqrt{x} + x\sqrt{y} = 10$

Answers to #4:

a)  $\frac{-3y}{4x}$

b)  $\frac{2x - y + 1}{x + 3y^2}$

c)  $\frac{-y(\sqrt{y} + 2\sqrt{x})}{x(\sqrt{x} + 2\sqrt{y})}$

5. Find the values of constants a and k such that the tangent to  $x + ay - kxy^2 = 4$  is horizontal at the point  $(1,1)$ . Answer:  $a=2, k=-1$

6. Find a relative max or min point for  $xy^2 + x^2y = 2$ . State which it is.

(Answer:  $(1,-2)$  Max)

7. Find a relative max point on the graph of  $9x^2 + 4y^2 - 18x + 18y - 43 = 0$ . (Answer  $(1,2)$  )

8. Find max or min points for  $4x^2 - 4xy + y^2 - 12x + 36 = 0$ . Answer: Min at  $\left(\frac{15}{4}, \frac{9}{2}\right)$