

Implicit Differentiation Worksheet ICMA B 2016

Find  $\frac{dy}{dx}$

1.  $5y^2 + \sin y = x^2$
2.  $x^3 + xy - 2x = 1$
3.  $\sqrt{y} - \sin x = 2$
4.  $x^2y + 3xy^3 = x$
5.  $\frac{1}{x} + \frac{1}{y} = 1$
6.  $\sin(x^2y^2) = x$
7.  $(\tan(xy^2 + y))^3 = x$
8.  $\sin(x + y) = y^2 \cos x$
9.  $4\cos x \sin y = \pi$
10.  $\sqrt[3]{x + y} = 1 + x^2y^2$

Find  $\frac{dx}{dy}$

11.  $\sqrt{xy} = 1 + x^3y$
12.  $\sin x + \sin y = \sin x \sin y$
13.  $\tan\left(\frac{x}{y}\right) = x + y$
14.  $\sqrt{y} - \sin x = 2x + y$
15.  $x^2 + xy + y^2 = 7$

Find  $\frac{d^2y}{dx^2}$

16.  $4x^2 + 2y^2 = 49$
17.  $y + \sin y = x$
18.  $x \cos y = y$
19.  $2xy - y^2 = 3$
20.  $x^3y^3 - 4 = 0$

Find the Equation of the Line Tangent to  $y=f(x)$  at the Given Point:

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

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

23.  $y^2(y^2 - 4) = x^2(x^2 - 5)$  at  $(0, -2)$

24.  $x^3 + y^3 = 6xy$  at  $(3,3)$

25. *For number 24 find where the tangent line is horizontal.*

26. Find  $a$  and  $b$  such that  $x^2y + ay^2 = b$  if  $(1,1)$  is on the graph and the line tangent at  $(1,1)$  has the equation  $4x + 3y = 7$ .

27. Find the equations of 2 lines through the origin and tangent to  $x^2 - 4x + y^2 + 3 = 0$ .

28. Find  $\frac{dy}{dx}$  if  $2y^3t + t^3y = 1$  and  $\frac{dt}{dx} = \frac{1}{\cos t}$ .

29. Find where the vertical and horizontal tangent lines to  $x^4 + y^4 = 16$  occur.

30. Find where the vertical and horizontal tangent lines to

$$2(x^2 + y^2)^2 = 25(x^2 - y^2) \text{ occur.}$$