EX 2.8 Implicit Differentiation

Find the derivative of each expression using implicit differentiation

Plot Waveform.

#1 $4x + 3y = 7$

$4 + 3y' = 0$

$3y' = -4$

$y' = \frac{-4}{3}$

$\frac{dy}{dx} = \frac{-4}{3}$

$4(1)(x^{1-1}) + 3(y^{1-1})(y') = 7(0)$

$4 + 3y' = 0$

$3y' = -4$

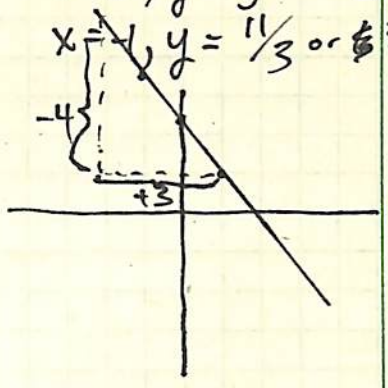
$y' = \frac{-4}{3}$

$\frac{dy}{dx} = \frac{-4}{3}$

$x=1, y=1$

$x=0, y=\frac{7}{3}$ or $2\frac{1}{3}$

$x=-1, y=\frac{11}{3}$ or ≈ 3.666



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

$2x - 2yy' = 0$

$-2yy' = -2x$

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

$\frac{dy}{dx} = \frac{x}{y}$

$2x^{2-1} - 2yy' = 9(0)$

#5. $x^2 + (y)^2 + 4(y) = 0$

$2x + 2yy' + 4y' = 0$

$2yy' + 4y' = -2x$

$y'(2y + 4) = -2x$

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

$\frac{dy}{dx} = \frac{-2x}{2y+4} = \frac{2(-x)}{2(y+2)}$

$\frac{dy}{dx} = \frac{-x}{y+2}$

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#7 $3x^2-(y)^3-(3x)(y)'=0$

$6x-3y^2y'-(3)(y)+(1)(y')(3x)=0$

$6x-3y^2y'-3y-3xy'=0$

$-3y^2y'-3xy'=-6x+3y$

$y'(-3y^2-3x)=-6x+3y$

$y'=\frac{-6x+3y}{-3y^2-3x}$

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

$y'=\left(\frac{y-2x}{-(y^2+x)}\right)\frac{-1}{-1}$

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

#9 $y^4-y^2(x)+x^2=0$

$4y^3y'-(2yy'(x)+(1)(y^2))+2x=0$

$4y^3y'-2xyy'-y^2+2x=0$

$4y^3y'-2xyy'=y^2-2x$

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

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

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#11 $y^4-(2y^2x^2)+3x^2=0$

$4y^3y'-[4yy'(x^2)+2x2y^2]+6x=0$

$4y^3y'-[4x^2yy'+4xy^2]+6x=0$

$4y^3y'-4x^2yy'-4xy^2+6x=0$

$4y^3y'-4x^2yy'=4xy^2-6x$

$y'(4y^3-4x^2y)=4xy^2-6x$

$y'=\frac{4xy^2-6x}{4y^3-4x^2y}=\frac{2(2xy^2-3x)}{2(2y^3-2x^2y)}$

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

#12 $3x^2y^2+4y^5+8x^2y^3+1xy=5$

$[6xy^2+2yy'3x^2+20y^4y'+[16xy^3+3y^2y'8x^2]+[(1)y+(1)y'x]=0$

$6xy^2+2yy'3x^2+20y^4y'+16xy^3+3y^2y'8x^2+y+xy'=0$

$6xy^2+6x^2yy'+20y^4y'+16xy^3+24x^2y^2y'+y+xy'=0$

$6x^2yy'+20y^4y'+24x^2yy'+xy'=-6xy^2-16xy^3-y$

$y'(6x^2y+20y^4+24x^2y+x)=-6xy^2-16xy^3-y$

$y'=\frac{-6xy^2-16xy^3-y}{6x^2y+20y^4+24x^2y+x}$