Section 3-10 : Implicit Differentiation

For problems 1 – 3 do each of the following.

(a) Find y' by solving the equation for *y* and differentiating directly.

(b) Find y' by implicit differentiation.

(c) Check that the derivatives in **(a)** and **(b)** are the same.

1. $\dfrac{x}{y^3}=1$

2. $x^2+y^3=4$

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

For problems 4 – 9 find y' by implicit differentiation.

4. $2y^3+4x^2-y=x^6$

5. $7y^2+\sin\left(3x\right)=12-y^4$

6. $\mathbf{e}^x-\sin\left(y\right)=x$

7. $4x^2y^7-2x=x^5+4y^3$

8. $\cos\left(x^2+2y\right)+x\mathbf{e}^{y^2}=1$

9. $\tan\left(x^2y^4\right)=3x+y^2$

For problems 10 & 11 find the equation of the tangent line at the given point.

10. $x^4+y^2=3$ at $\left(1,-\sqrt{2}\right)$.

11. $y^2\mathbf{e}^{2x}=3y+x^2$ at $\left(0,3\right)$.

For problems 12 & 13 assume that $x=x\left(t\right)$, $y=y\left(t\right)$ and $z=z\left(t\right)$ and differentiate the given equation with respect to *t*.

12. $x^2 - y^3 + z^4 = 1$

13. $x^2 \cos(y) = \sin(y^3 + 4z)$