

Exercise 19. Differentiating implicit functions

In Problems 1 and 2 differentiate the given functions with respect to x .

1. (a) $3y^5$ (b) $2 \cos 4\theta$ (c) \sqrt{k}

2. (a) $\frac{5}{2} \ln 3t$ (b) $\frac{3}{4} e^{2y+1}$ (c) $2 \tan 3y$

3. Differentiate the following with respect to y :

(a) $3 \sin 2\theta$ (b) $4\sqrt{x^3}$ (c) $\frac{2}{e^t}$

4. Differentiate the following with respect to u :

(a) $\frac{2}{(3x+1)}$ (b) $3 \sec 2\theta$ (c) $\frac{2}{\sqrt{y}}$

Exercise 20. Differentiating implicit functions involving products and quotients

1. Determine $\frac{d}{dx}(3x^2y^3)$

2. Find $\frac{d}{dx}\left(\frac{2y}{5x}\right)$

3. Determine $\frac{d}{du}\left(\frac{3u}{4v}\right)$

4. Given $z = 3\sqrt{y}\cos 3x$ find $\frac{dz}{dx}$

5. Determine $\frac{dz}{dy}$ given $z = 2x^3 \ln y$

Exercise 21. Implicit differentiation

In Problems 1 and 2 determine $\frac{dy}{dx}$

1. $x^2 + y^2 + 4x - 3y + 1 = 0$

2. $2y^3 - y + 3x - 2 = 0$

3. Given $x^2 + y^2 = 9$ evaluate $\frac{dy}{dx}$ when $x = \sqrt{5}$

and $y = 2$

In Problems 4 to 7, determine $\frac{dy}{dx}$

4. $x^2 + 2x \sin 4y = 0$

5. $3y^2 + 2xy - 4x^2 = 0$

6. $2x^2y + 3x^3 = \sin y$

7. $3y + 2x \ln y = y^4 + x$