

CUET B.Sc, Higher Math Classes

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Worksheet 2

Part I: Problems on Differentiation

1. Consider the function

$$y = \frac{x^4 + x^2 + 1}{x^2 + x + 1}$$

Find $\frac{dy}{dx}$ in two methods. One of the methods is obviously Quotient rule. The second one is tricky.

2. Differentiate the following with respect to the variable you see:

- $f(w) = \sqrt{7w} + e^{-w}$
- $f(x) = \cos(x^2 e^x)$
- $f(x) = 2 \sin(3x + \tan(x))$
- $f(x) = \frac{(x^2 \sin x)}{(x^2+1)}$
- $f(x) = \frac{e^x}{\sqrt{x}}$
- $f(x) = \frac{e^{\sqrt{x}}}{x}$
- $f(t) = \ln(\ln t) + \sec^2 t$

- $g(u) = \sec u \times \tan u$

3. Find $\frac{\partial f}{\partial x}$ and $\frac{\partial f}{\partial y}$ for the following functions:

- $f(x, y) = (xy - 1)^2$

- $f(x, y) = \frac{1}{x+y}$

- $f(x, y) = \sin^2(x - 3y)$

- $f(x, y) = x^y$

4. Find $\frac{\partial f}{\partial x}$, $\frac{\partial f}{\partial y}$ and $\frac{\partial f}{\partial z}$ for the functions

- $f(x, y, z) = 1 + xy^2 - 2z^2$

- $f(x, y, z) = x - \sqrt{y^2 + z}$

- $f(x, y, z) = e^{-xyz}$

- $f(x, y, z) = xyz - ze^{xy}$

Part II: Problems involving Trigonometry

5. If $\cos x + \cos^2 x = 1$, find the value of $\sin^2 x + \sin^4 x$

6. Find

$$\frac{d}{dx} (\cos^2 x - \sin^2 x)$$

in two methods.

7. Prove that

$$\tan(A + B) = \frac{\tan A + \tan B}{1 - \tan A \tan B}$$

$$\tan(A - B) = \frac{\tan A - \tan B}{1 + \tan A \tan B}$$