

# Derivatives Question Bank

## 2<sup>nd</sup> Semester Diploma Engineering for All Branch

### ➤ Derivative of Sum and Difference

Q.1. find  $\frac{dy}{dx}$ , if  $y = e^{\log x}$

Q.2. If  $y = \sin x + e^x$ . Find  $\frac{dy}{dx}$

Q.3. If  $y = e^x - \frac{1}{x} + \log x$ , find  $\frac{dy}{dx}$

Q.4. Differentiate w.r.t.  $x$   $(\sqrt{x} + \frac{1}{\sqrt{x}})^2$

Q.5. Find  $\frac{dy}{dx}$ , if  $y = (x + 1)(x + 2)$

Q.6. Find  $\frac{dy}{dx}$ , if  $y = x^{10} + 10^x + e^x$

Q.7. Find  $\frac{dy}{dx}$ , if  $y = \log_{10} x + 3^x$

Q.8. If  $y = \log x + e^x + \sqrt{x} - \frac{1}{x}$ . Find  $\frac{dy}{dx}$



### ➤ Derivative of Product

$$\frac{d}{dx}(u \cdot v) = u \cdot \frac{d}{dx}(v) + v \cdot \frac{d}{dx}(u) = u \cdot \frac{dv}{dx} + v \cdot \frac{du}{dx}$$

Q.1. If  $y = e^x \cdot x$ , find  $\frac{dy}{dx}$

Q.2. If  $y = x \cdot \sin x$ , find  $\frac{dy}{dx}$

Q.3. Find  $\frac{dy}{dx}$ , if  $y = \sec x \cdot \tan x$

Q.4. If  $e^x + e^y = e^{x+y}$  find  $\frac{dy}{dx}$

Q.5. Find  $\frac{dy}{dx}$ , if  $y = e^x \tan x$

Q.6. Find  $\frac{dy}{dx}$ , if  $y = a^x \cdot x^a$

Q.7. If  $y = e^x \cdot \sin x \cos x$ , find  $\frac{dy}{dx}$

Q.8. If  $y = (1 + x^2) \cdot \tan^{-1} x$ , find  $\frac{dy}{dx}$



### ➤ Derivative of Quotient or Division

$$\frac{d}{dx}\left(\frac{u}{v}\right) = \frac{v \cdot \frac{du}{dx} - u \cdot \frac{dv}{dx}}{v^2}$$

Q.1. If  $y = \frac{e^x}{x}$ , find  $\frac{dy}{dx} = ?$

Q.2. If  $y = \frac{\tan x}{1+x^2}$  find  $\frac{dy}{dx}$

Q.3. Find  $\frac{dy}{dx}$ , if  $y = \frac{x+1}{x-1}$

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Q.4. If  $y = \frac{e^x + e^{-x}}{e^x - e^{-x}}$  find  $\frac{dy}{dx}$

Q.5. Find  $\frac{dy}{dx}$ , if  $y = \frac{\sin x}{1 + \cos x}$



### ➤ Derivative of Composite Function

Q.1. Find  $\frac{dy}{dx}$ , if  $y = \cos(5x)$

Q.2. Find  $\frac{dy}{dx}$ , if  $y = 2^x + \cos 3x$

Q.3. Find  $\frac{dy}{dx}$ , if  $y = \sin^3 x$

Q.4. Find  $\frac{dy}{dx}$ , if  $y = \log(x^2 + 2x)$

Q.5. Find  $\frac{dy}{dx}$ , if  $y = \sin(2x + 1)$

Q.6. Find  $\frac{dy}{dx}$ , if  $y = \cos^2 x$

Q.7. If  $y = \sin(e^{3x})$ , find  $\frac{dy}{dx}$

Q.8. If  $y = e^{\log x}$ , find  $\frac{dy}{dx}$

Q.9. Find  $\frac{dy}{dx}$ , if  $y = \log(xe^x)$

Q.10. find  $\frac{dy}{dx}$ , if  $y = \log(\sec x + \tan x)$

Q.11. find  $\frac{dy}{dx}$ , if  $y = e^{3x} \cdot \sin 2x$



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### ➤ derivatives of Inverse Functions

Q.1. differentiate w.r.t.,  $\tan \left[ \cot^{-1} \left( \frac{1}{x} \right) \right]$

Q.2. differentiate  $\sin^{-1}(\cos x)$  w.r.t. x

### ➤ derivatives of Implicit Functions

Q.1. find  $\frac{dy}{dx}$ , if  $x^2 + y^2 = 25$

Q.2. If  $\tan^{-1}(x^2 + y^2) = a^2$  find  $\frac{dy}{dx}$

Q.3. If  $(x^2 + y^2) = \sin(a^2)$  show that,  $\frac{dy}{dx} = \frac{-x}{y}$

Q.4. If  $x^2 + y^2 = xy$ , find  $\frac{dy}{dx}$

Q.5. Find  $\frac{dy}{dx}$ , if  $x^2 + y^2 = 4xy$

Q.6. Find  $\frac{dy}{dx}$ , if  $13x^2 + 2x^2y + y^3 = 1$

Q.7. If  $x^3 + y^3 = 3axy$ , find  $\frac{dy}{dx}$



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### ➤ Logarithmic differentiation

Q.1. Find  $\frac{dy}{dx}$ , if  $y = x^x$

Q.2. If  $e^y = y^x$ , show that  $\frac{dy}{dx} = \frac{(\log y)^2}{\log y - 1}$

Q.3. If  $x^y = e^{x-y}$  show that  $\frac{dy}{dx} = \frac{\log x}{(1+\log x)^2}$

Q.4. Differentiate  $(\log x)^{\sin x}$  w.r.t.  $x$

Q.5. Differentiate  $(\sin x)^{\tan x}$  w.r.t.  $x$



### ➤ Derivatives of Parametric Function

Q.1. Find  $\frac{dy}{dx}$  if  $x = 4at^2, y = 3at^4$

Q.2. Find  $\frac{dy}{dx}$  if  $x = r \cos \theta, y = r \sin \theta$

Q.3. Find  $\frac{dy}{dx}$  if  $x = 3 \sin 4\theta, y = 4 \cos 3\theta$

Q.4. If  $x = 3 \cos \theta - 2 \cos 3\theta, y = 3 \sin \theta - 2 \sin 3\theta$  find  $\frac{dy}{dx}$

Q.5. Find  $\frac{dy}{dx}$  if  $x = a(2\theta - \sin 2\theta), y = a(1 - \cos 2\theta)$  at  $\theta = \frac{\pi}{4}$

Q.6. Find  $\frac{dy}{dx}$  if  $x = a(\theta + \sin \theta), y = a(1 - \cos \theta)$



### ➤ Derivatives of one function with respect to another function

Q.1. Differentiate  $\sin 2x$  w.r.t.  $\tan^{-1} x$

Q.2. Differentiate  $\log(1 + x^2)$  w.r.t.  $\tan^{-1} x$

Q.3. Differentiate  $\log(x \sin x)$  w.r.t.  $\frac{1}{x}$



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