

28 More Integrals
#1-19Stew Dent
date per

$$1. y = \ln x^6 = 6 \cdot \ln x$$

$$y' = 6 \cdot \frac{1}{x} = \frac{6}{x}$$

$$2. y = (\ln x)^6$$

$$y' = 6(\ln x)^5 \cdot \frac{1}{x} = \frac{6}{x}(\ln x)^5$$

$$3. y = \ln(\tan x)$$

$$y' = \frac{1}{\tan x} \cdot \sec^2 x = \cot x \cdot \sec^2 x = \frac{\cos x}{\sin x} \cdot \frac{1}{\cos^2 x} = \sec x \csc x$$

$$4. y = \frac{\tan x}{\ln x}$$

$$\frac{\tan x}{\sec^2 x} \neq \ln x \cdot \frac{1}{x}$$

$$y' = \frac{\ln x \cdot \sec^2 x - \frac{\tan x}{x}}{(\ln x)^2}$$

$$5. y = e^{5x}$$

$$y' = e^{5x} \cdot 5 = 5e^{5x}$$

$$6. y = 4e^{1-2x}$$

$$y' = 4e^{1-2x} \cdot (-2) = -8e^{1-2x}$$

$$7. y = e^{\sin x}$$

$$y' = e^{\sin x} \cdot \cos x$$

$$8. y = \frac{x}{e^{4x}}$$

$$\frac{x}{1} \neq \frac{e^{4x}}{4e^{4x}}$$

$$y' = \frac{e^{4x} - 4xe^{4x}}{(e^{4x})^2} = \frac{e^{4x}(1-4x)}{e^{4x} \cdot e^{4x}} = \frac{1-4x}{e^{4x}}$$

$$9. y = \ln(x + e^x)$$

$$y' = \frac{1}{x + e^x} \cdot (1 + e^x) = \frac{1 + e^x}{x + e^x}$$

$$10. y = -2x^2 + \ln x - 1$$

$$y' = -4x + \frac{1}{x}$$

$$m = y'(1) = -4(1) + \frac{1}{1} = -3$$

$$\rightarrow y + 3 = -3(x - 1)$$

or

$$y = -3x$$

$$11. xe^y + 8x - 3y = 0$$

$$e^y + xe^y \frac{dy}{dx} + 8 - 3 \frac{dy}{dx} = 0$$

$$xe^y \frac{dy}{dx} - 3 \frac{dy}{dx} = -e^y - 8$$

$$\frac{dy}{dx} (xe^y - 3) = -e^y - 8$$

$$\frac{dy}{dx} = \frac{-e^y - 8}{xe^y - 3} \quad \text{or} \quad \frac{e^y + 8}{3 - xe^y}$$

$$x \neq \frac{e^y}{e^y \cdot \frac{dy}{dx}}$$

$$12. \int \frac{1}{x} dx = \ln|x| + C$$

$$13. \int \frac{1}{5x-2} dx$$

$$u = 5x - 2$$

$$du = 5 dx \rightarrow dx = \frac{1}{5} du$$

$$\frac{1}{5} \int \frac{1}{u} du = \frac{1}{5} \ln|5x-2| + C$$

$$14. \int \frac{4}{3-6x} dx = \frac{4}{3} \int \frac{1}{1-2x} dx \quad u = 1-2x$$

$$du = -2 dx \rightarrow dx = -\frac{1}{2} du$$

$$= -\frac{4}{6} \int \frac{1}{u} du = -\frac{2}{3} \ln|1-2x| + C$$

$$15. \int \frac{7x}{x^2-4} dx$$

$$u = x^2 - 4$$

$$du = 2x dx \rightarrow x dx = \frac{1}{2} du$$

$$= \frac{7}{2} \int \frac{1}{u} du$$

$$= \frac{7}{2} \ln|x^2-4| + C$$

$$16. \int \frac{\cos x}{2 + \sin x} dx \quad u = 2 + \sin x$$
$$du = \cos x dx$$
$$= \int \frac{1}{u} du = \ln|2 + \sin x| + C$$

$$17. \int e^{5x} dx \quad u = 5x$$
$$du = 5 dx \rightarrow dx = \frac{1}{5} du$$
$$= \frac{1}{5} \int e^u du = \frac{1}{5} e^{5x} + C$$

$$18. \int 4e^{-x} dx \quad u = 1 - x$$
$$du = -1 dx \Rightarrow dx = -du$$
$$= -4 \int e^u du = -4e^{-x} + C$$

$$19. \int 2xe^{x^2} dx \quad u = x^2$$
$$du = 2x dx$$
$$= \int e^u du = e^{x^2} + C$$