

OF EACH PAGE ONLY

$$\frac{1}{2} \ln|2x-1| + C$$

$$-\ln|\sec\theta|^{-1} = \ln|\sec\theta| + C$$

$$-\ln|\cos\theta| + C$$

$$\frac{e^x}{x^2} \sim \frac{e^x}{2x} \sim \frac{e^x}{2}$$

1. $\int \frac{dx}{2x-1} = ?$

2. $\int \tan\theta d\theta = ?$

3. $\lim_{x \rightarrow +\infty} x^{-2} e^x = ? + \infty$

4. Find $\frac{dy}{dx}$ if $y = \ln(2x) + e^{x^2} + \log_2 x + \pi^x + \pi e^2$

$$\frac{1}{2x} + e^{x^2}(2x) + \frac{1}{x \ln 2} + \pi^x \ln \pi + 0$$

5/2

5. Find $\frac{dy}{dx}$ if $y = \ln|x^2 \sqrt{x^2-1}| + e^{x \ln x} + \frac{1}{x \sqrt{x}}$

$$\left(\frac{2}{x} + \frac{1}{2} \frac{2x}{x^2-1}\right) dx$$

$$\frac{1}{x^2 \sqrt{x^2-1}} [2x \sqrt{x^2-1} + \frac{x^2}{2} (x^2-1)^{-1/2} 2x] + e^{x \ln x} [\ln x + 1]$$

3/2

6. Find $\frac{dy}{dx}$ if $e^{x^2} y = 1$

7. $\int x \ln x dx = ?$

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

$x^2 y = 0$

$$e^{x^2} y [2xy + x^2 \frac{dy}{dx}] = 0 \quad \frac{dy}{dx} = \frac{-2xy e^{x^2} y}{x^2 e^{x^2} y} = \frac{-2y}{x}$$

8. $\lim_{x \rightarrow +\infty} (x)^{1/x} = ?$

9. Find the general solution to the D.E. $\frac{dy}{dx} = y(1-2x)$

$$y = x^{1/x} \quad \ln y = \frac{\ln x}{x} \sim \frac{1}{x} \sim 0$$

$$\frac{dy}{y} = (1-2x) dx$$

10. Suppose $y(t)$ = population at time t which satisfies $\frac{dy}{dt} = ky$. Suppose further that

$y = 2$ at $t = 0$ and $y = 32$ at $t = 2$.

what is the population at $t = 10$?

$$\ln|y| = x - x^2 + C$$

$$|y| = e^{x-x^2+C}$$

$$y = A e^{x-x^2}$$

$$y(t) = A_0 e^{kt}$$

$$2 = y(0) = A_0 e^{k \cdot 0} = A_0$$

$$y(t) = 2 e^{kt}$$

$$32 = 2 e^{2k}$$

$$y(t) = 2 \cdot 4^t$$

$$16 = [e^k]^2 \quad e^k = 4$$

$$y(10) = 2 \cdot 4^{10} = 2 \cdot 2^{20} = 2^{21}$$