

1. If

$$\frac{d}{dx} (f(x)) = 2x + \frac{3}{x} \quad (1)$$

and $f(1) = 1$, then $f(x)$ is

(a) $x^2 + 3 \log|x| + 1$

(b) $x^2 + 3 \log|x|$

(c) $2 - \frac{3}{x^2}$

(d) $x^2 + 3 \log|x| - 4$

2. The integral factor of the differential equation

$$(1 - y^2) \frac{dx}{dy} + yx = ay, (-1 < y < 1) \quad (2)$$

is

(a) $\frac{1}{y^2 - 1}$

(b) $\frac{1}{\sqrt{y^2 - 1}}$

(c) $\frac{1}{1 - y^2}$

(d) $\frac{1}{\sqrt{1 - y^2}}$

3. Anti derivative of $\frac{\tan(x) - 1}{\tan(x) + 1}$ with respect to x is:

(a) $\sec^2(\frac{\pi}{4} - x) + c$

(b) $-\sec^2(\frac{\pi}{4} - x) + c$

(c) $\log |\sec(\frac{\pi}{4} - x)| + c$

(d) $-\log |\sec(\frac{\pi}{4} - x)| + c$

4. Evaluate $\int_{\log \sqrt{2}}^{\log \sqrt{3}} \left(\frac{1}{(e^x + e^{-x})(e^x - e^{-x})} \right) dx$

5. (a) Find the general solution of the differential equation:

$$(xy - x^2) dy = y^2 dx \quad (3)$$

(b) Find the general solution of the differential equation:

$$(x^2 + 1) \frac{dy}{dx} + 2xy = \sqrt{x^2 + 4} \quad (4)$$

6. (a) Evaluate $\int_{-1}^1 |x^4 - x| dx$

(b) Find $\int e^x \left(\frac{\sin^{-1} x}{(1-x^2)^{\frac{3}{2}}} \right) dx$

7. Find $\int e^x \left(\frac{1 - \sin x}{1 - \cos x} \right) dx$