Name: ___Solution___   I.D. # _____   Section # ____

1. Find the position function $x(t)$ of a moving particle with acceleration $a(t) = 9\text{m}/\sec^2$ if its initial position is 15m and its initial velocity is 3m/sec.

$$a(t) = 9 \quad, \quad V_0 = 3 \quad, \quad X_0 = 15$$

$$V(t) = \int 9\, dt = 9t + V_0 = 9t + 3$$

$$X(t) = \int (9t + 3)\, dt = \frac{9}{2}t^2 + 3t + X_0$$
$$= \frac{9}{2}t^2 + 3t + 15$$

∴ the position function is $X(t) = \frac{9}{2}t^2 + 3t + 15$

2. Solve the following initial value problem: $y' = y\cos x - xy$, $y(0) = 1$

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

$$\frac{dy}{y} = (\cos x - x)\, dx$$

Integrating we get,

$$\ln|y| = \sin x - \frac{x^2}{2} + c \quad \text{or} \quad \ln y = \sin x - \frac{x^2}{2} + c$$

using the initial condition $y(0) = 1 \implies c = 0$

Hence the solution is $\ln y = \sin x - \frac{x^2}{2}$

i.e. $y = e^{\sin x - \frac{x^2}{2}}$