SID : 530157791

1.(a)

Standard form : $\frac{dy}{dx} = 2xe^{x^2}$

General Solution : $\frac{dy}{dx} = 2xe^{x^2}$

$$\int dy = \int 2xe^{x^2} dx$$

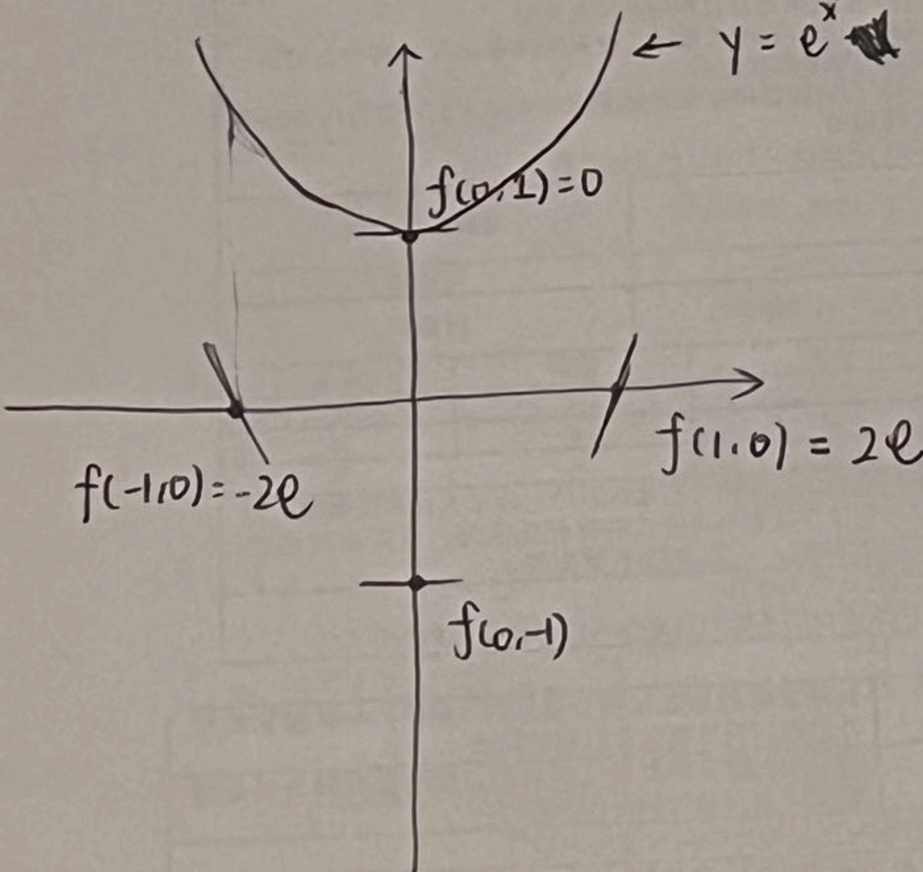
$$y = e^{x^2} + C$$

Particular Solution :

$$1 = e^{0} + C$$

$$C = 0$$

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



1.(b)

Standard Form: $\frac{dy}{dx} = -\frac{x}{y}$

General Solution: $y\,dy = -x\,dx$

$$\int y\,dy = \int -x\,dx$$

$$\frac{y^2}{2} = -\frac{x^2}{2} + C$$

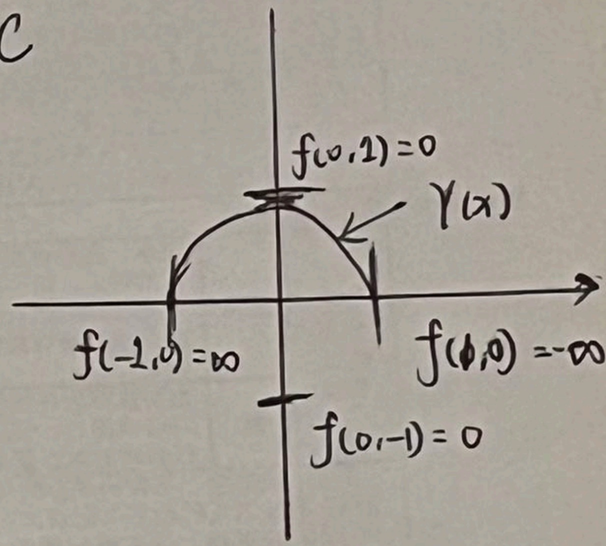
$$y = \pm\sqrt{-x^2 + 2C}$$

Particular Solution:

$$1 = \sqrt{2C}$$

$$2C = 1$$

$$\therefore\ y = \sqrt{-x^2 + 1}$$



2. (a)

$$\frac{dV}{\sqrt{V}} = -(1+\sin t)\,dt$$

$$\int \frac{dV}{V^{\frac{1}{2}}} = \int -(1+\sin t)\,dt$$

$$2V^{\frac{1}{2}} = -t + \cos t + C$$

$$V = \frac{(C-t+\cos t)^2}{4}$$

(b)

$$V(0) = 4^3$$

we have $\frac{(C+1)^2}{4} = 64$

$$C = 15$$

$$V(t) = \frac{(15-t+\cos t)^2}{4}$$

(c) $V(T) = 0$

$$\Rightarrow \frac{(15-T+\cos T)^2}{4} = 0$$

$$\Rightarrow 15 - T + \cos T = 0$$

$$\Rightarrow T = 15 + \cos T$$

Since, $T \geqslant 0$, $\cos T \in [-1, 1]$

We have $T \in [14, 16]$

Then, we need to ~~dicus~~ discuss whether T can equal 14.

Assume $T = 14$:

$$\begin{cases} T = 14 \\ \cos T = -1 \Rightarrow T = \pi + 2k\pi,\ k \in \mathbb{Z} \end{cases}$$

which leads to a contradiction

Thus $T \neq 14$. $T \in (14, 16]$

Therefore $T > 14$