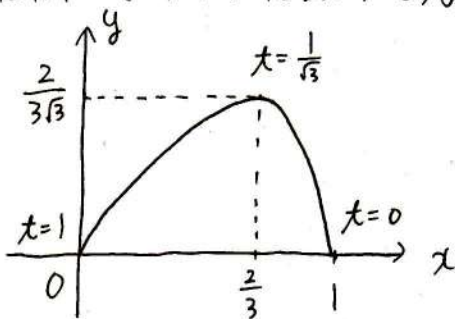


$$(1) \frac{dx}{dt} = -2t, \quad \frac{dy}{dt} = 1-3t^2 \quad \text{となる.}$$

したがってグラフは以下のようになる.



t	$0 \cdots \frac{1}{3} \cdots 1$
$\frac{dx}{dt}$	$/ \quad - \quad - \quad - \quad /$
x	$1 \leftarrow \frac{2}{3} \leftarrow 0$
$\frac{dy}{dt}$	$/ \quad + \quad 0 \quad - \quad /$
y	$0 \quad \uparrow \quad \frac{2}{3} \quad \downarrow \quad 0$
(x,y)	$(1,0) \nearrow (\frac{2}{3}, \frac{2}{3}) \searrow (0,0)$

$$(2) S = \int_0^1 y dx = \int_1^0 (t-t^3) \cdot (-2t) dt$$

$$x \mid 0 \rightarrow 1$$

$$t \mid 1 \rightarrow 0$$

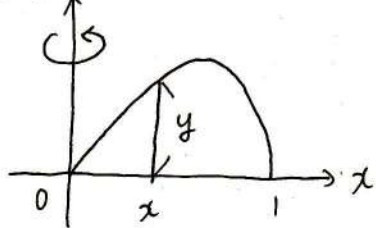
$$dx = -2t dt$$

$$= 2 \int_0^1 t(t-t^3) dt$$

$$= 2 \int_0^1 (t^2 - t^4) dt$$

$$= 2 \left[\frac{1}{3} t^3 - \frac{1}{5} t^5 \right]_0^1 = \underline{\underline{\frac{4}{15}}}$$

(3) y



バーンハート-ヘン分割を用いると

$$V = \int_0^1 2\pi x \cdot y dx \quad \begin{array}{l} x \mid 0 \rightarrow 1 \\ t \mid 1 \rightarrow 0 \end{array}$$

$$= 2\pi \int_1^0 x y \frac{dx}{dt} dt$$

$$= 2\pi \int_0^1 (1-t^2)(t-t^3) \cdot (-2t) dt$$

$$= 4\pi \int_0^1 t(1-t^2)(t-t^3) dt$$

$$= 4\pi \int_0^1 (t^6 - 2t^4 + t^2) dt$$

$$= 4\pi \left[\frac{1}{7} t^7 - \frac{2}{5} t^5 + \frac{1}{3} t^3 \right]_0^1 = \underline{\underline{\frac{32}{105} \pi}}$$