

$$\textcircled{2} \quad x = 4t^3 - t^2$$

and $t = 3$

$$y = t^2 + 2t^2 \text{ at } t = 1$$

$$A = \int_1^3 y \, dx$$

given $y = t^2 + 2t^2$

$$A = \int_1^3 (t^2 + 2t^2) \, dx$$

given $x = 4t^3 - t^2$

$$\frac{dx}{dt} = 12t^2 - 2t$$

$$dx = (12t^2 - 2t) \, dt$$

$$A = \int_1^3 (t^2 + 2t^2) (12t^2 - 2t) \, dt$$

$$= \int_1^3 (12t^6 - 2t^5 + 24t^4 - 4t^3) \, dt$$

$$\left[12t^6 - 2t^5 + 24t^4 - 4t^3 \right]_1^3$$

$$\left[12(3)^6 - 2(3)^5 + 24(3)^4 - 4(3)^3 \right] - \left[12 - 2 + 24 - 4 \right]$$

$$10098 - 30$$

10068 square units

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$$3 \quad x = 4t^3 - t^2$$

$$y = 4 + 12t^2$$

$$\frac{dx}{dt} = 12t^2 - 2t$$

$$\frac{dy}{dt} = 4t^3 + 4t$$

$$\frac{dy}{dx} = \frac{dy}{dt} \div \frac{dx}{dt}$$

$$\frac{4t^3 + 4t}{12t^2 - 2t}$$

$$\frac{4t^3 + 4t}{12t^2 - 2t}$$

~~4t^3 + 4t~~
~~12t^2 - 2t~~