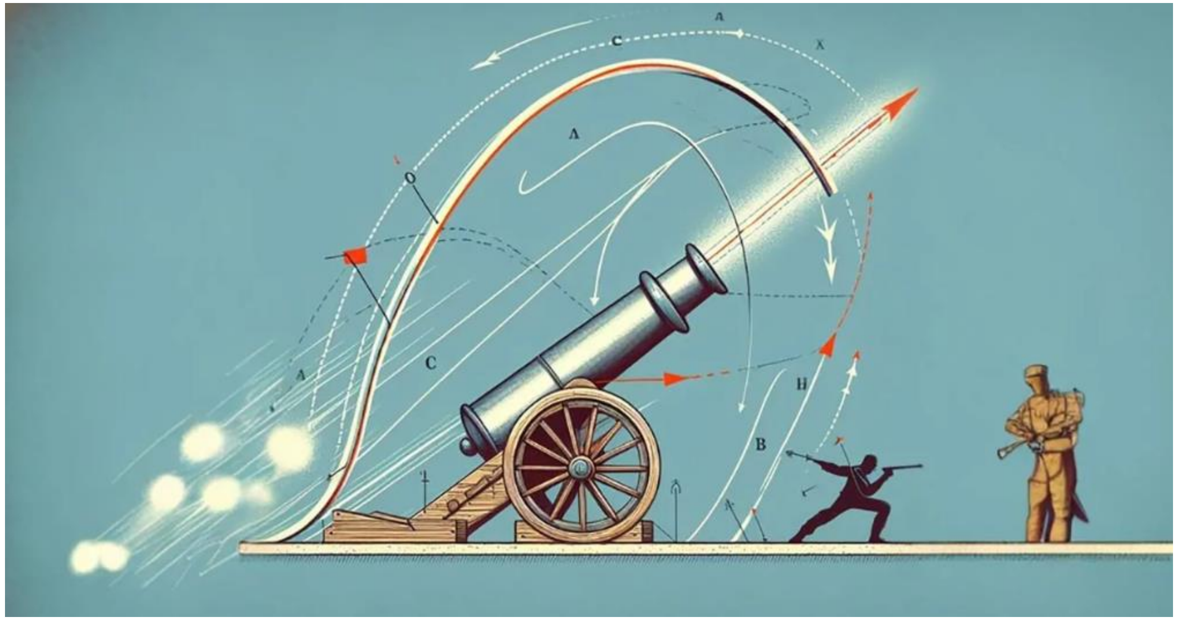
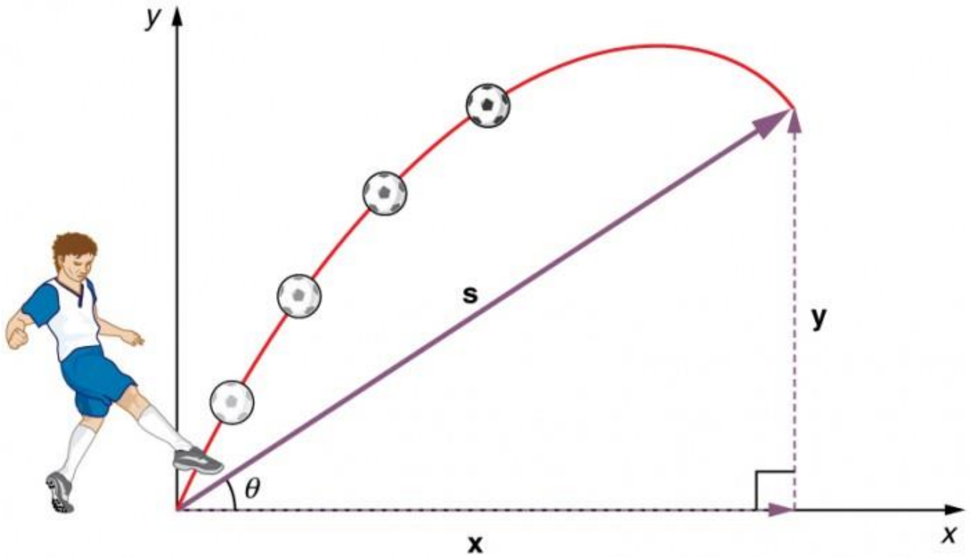




$$x(t) = V_0 t cos(\theta)$$

$$y(t) = -\frac{1}{2}gt^2 + V_0 t sin\theta$$

$x = t^2 - t$ $\rightarrow$ $0 = t^2 - t \Rightarrow t(t-1) = 0 \begin{cases} t = 0 \\ t = 1 \end{cases}$

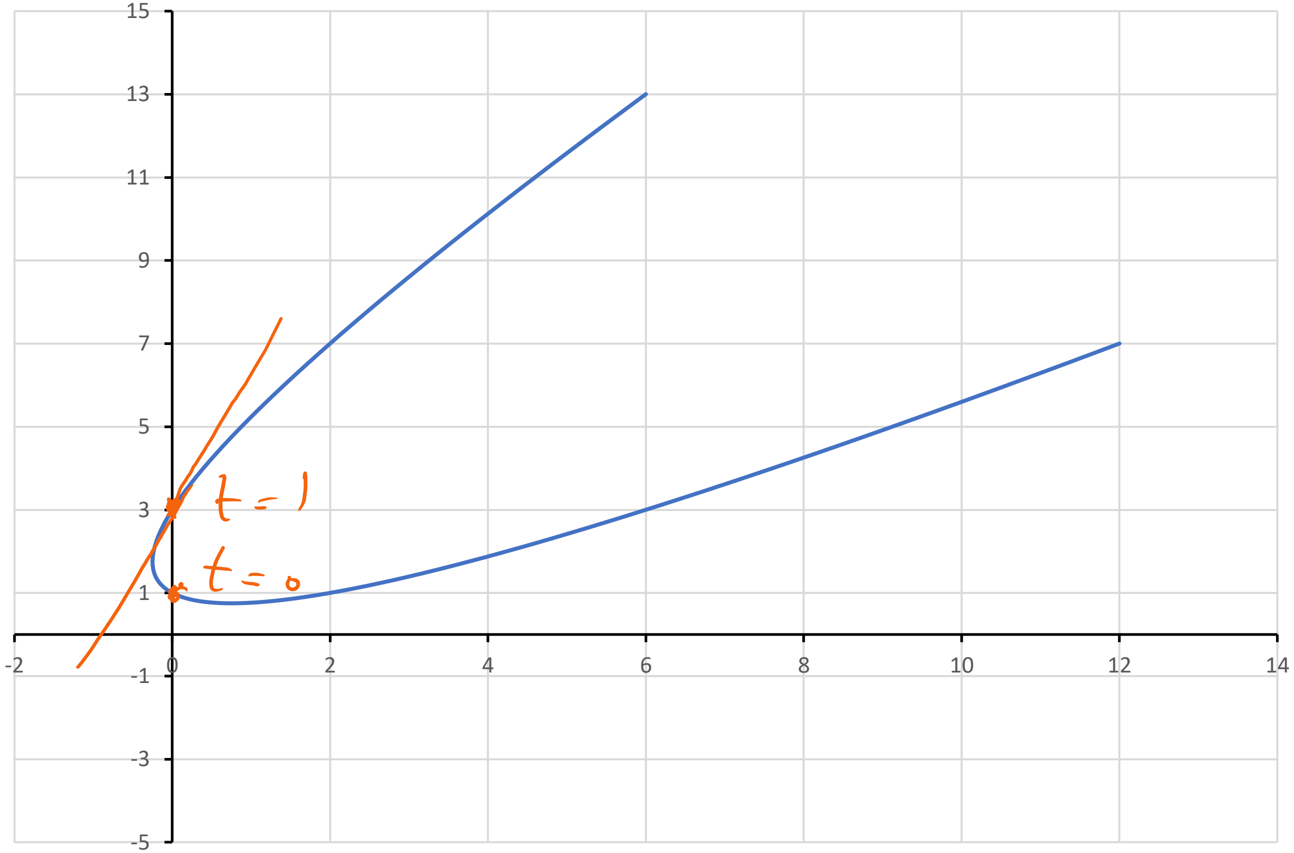
$y = t^2 + t + 1$

$y - y_0 = m(x - x_0)$

$(x, y) = (0,3)$

$m = \dfrac{dy}{dx} = \dfrac{\frac{dy}{dt}}{\frac{dx}{dt}} = \dfrac{2t+1}{2t-1} = \dfrac{3}{1} = 3$

$\underline{y = 3x + 3}$



$x = t^2 - 2t \; = 8$

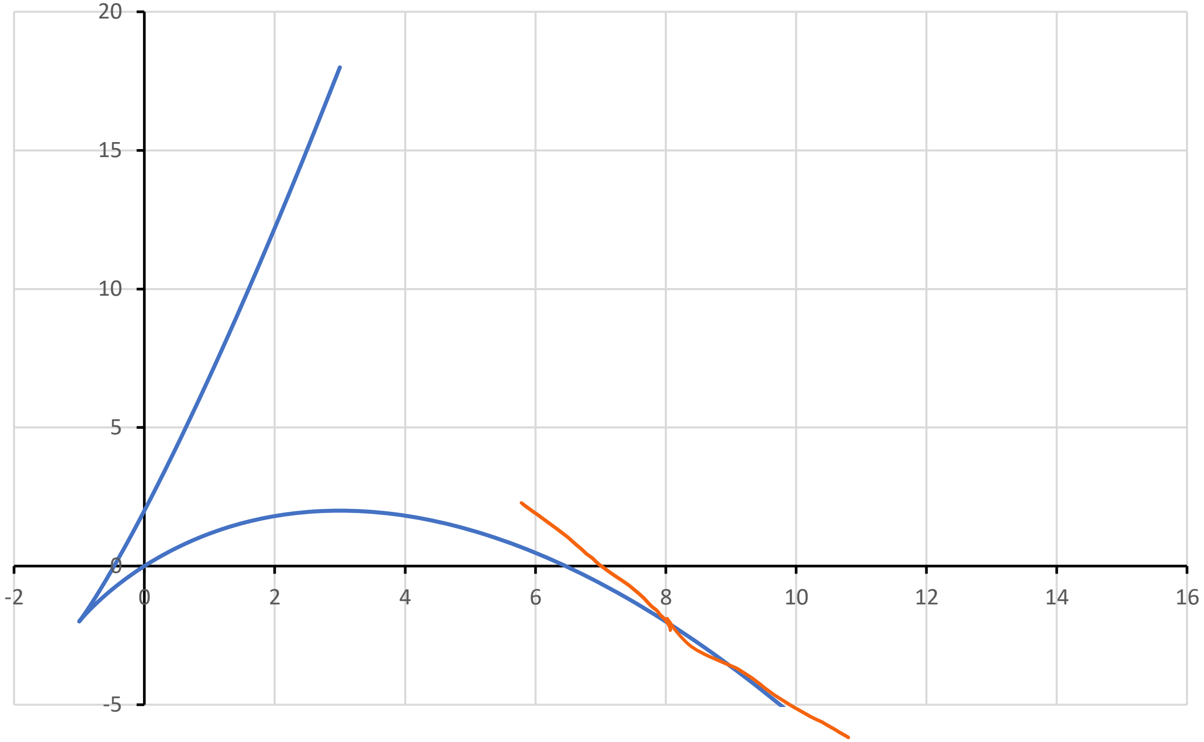
$y = t^3 - 3t \; -8 + 6 = -2$

$y - (-2) = m(x - 8)$

$t = -2$

$$m = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{3t^2 - 3}{2t - 2} = \frac{12 - 3}{-6} = \frac{+9}{-6} = -\frac{3}{2}$$

$$y = -\frac{3}{2}(x - 8) - 2 = -\frac{3}{2}x + 10$$



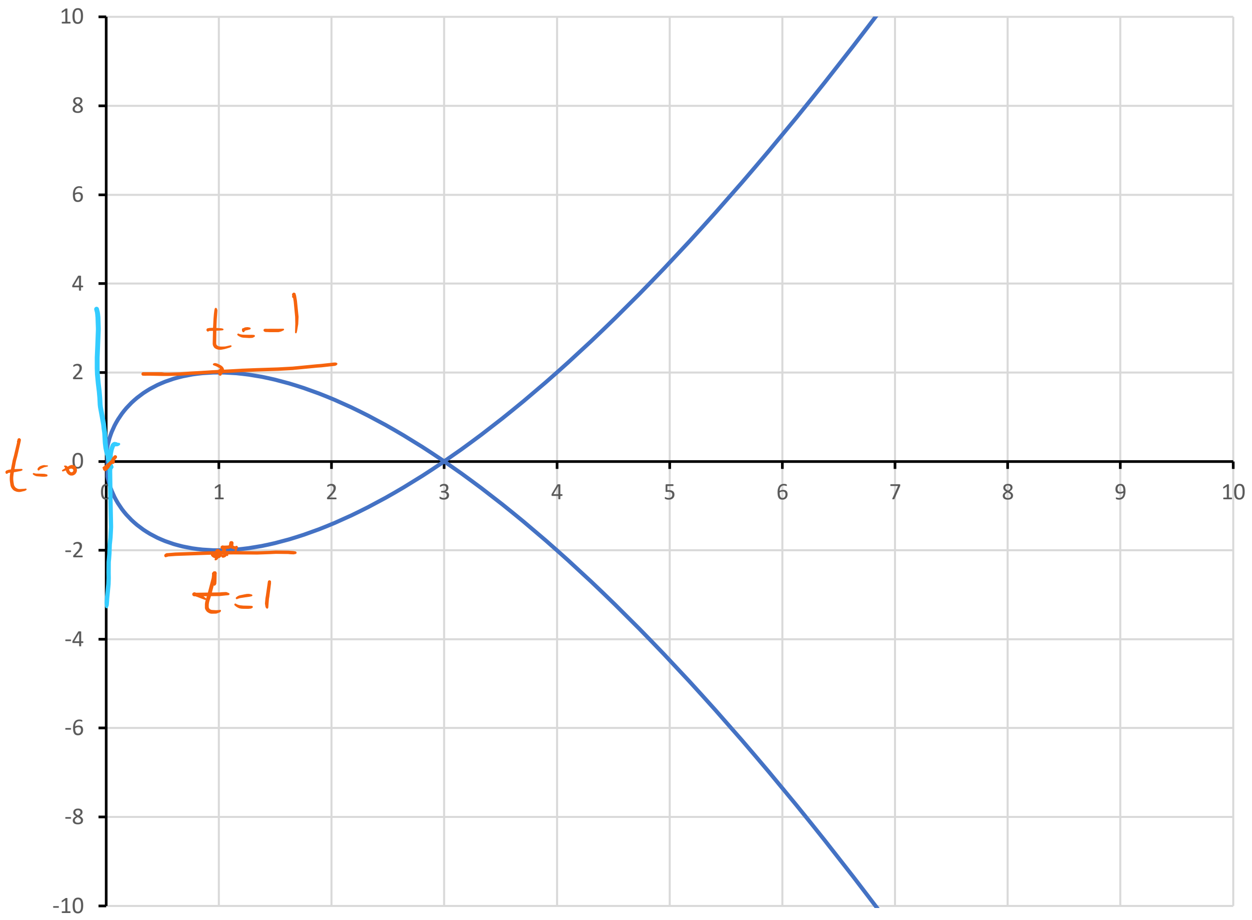
$$x = t^2$$

$$y = t^3 - 3t$$

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

مماس قائم

$$\begin{cases} \boxed{\dfrac{dx}{dt} = 0 \ , \ \dfrac{dy}{dt} \neq 0} \\ \\ \dfrac{dx}{dt} \neq 0 \ , \ \dfrac{dy}{dx} = 0 \end{cases}$$



$$\frac{dy}{dt} = 3t^2 - 3 = 3(\underbrace{t^2-1}_{0}) \Rightarrow \begin{cases} t=-1 \\ t=1 \end{cases}$$

$$\frac{dx}{dt} = 2t$$

$$y = t^3 - 3t \Rightarrow y=0 \Rightarrow t(t^2-3)=0 \begin{cases} t=0 \\ t=\pm\sqrt{3} \ \checkmark \end{cases}$$

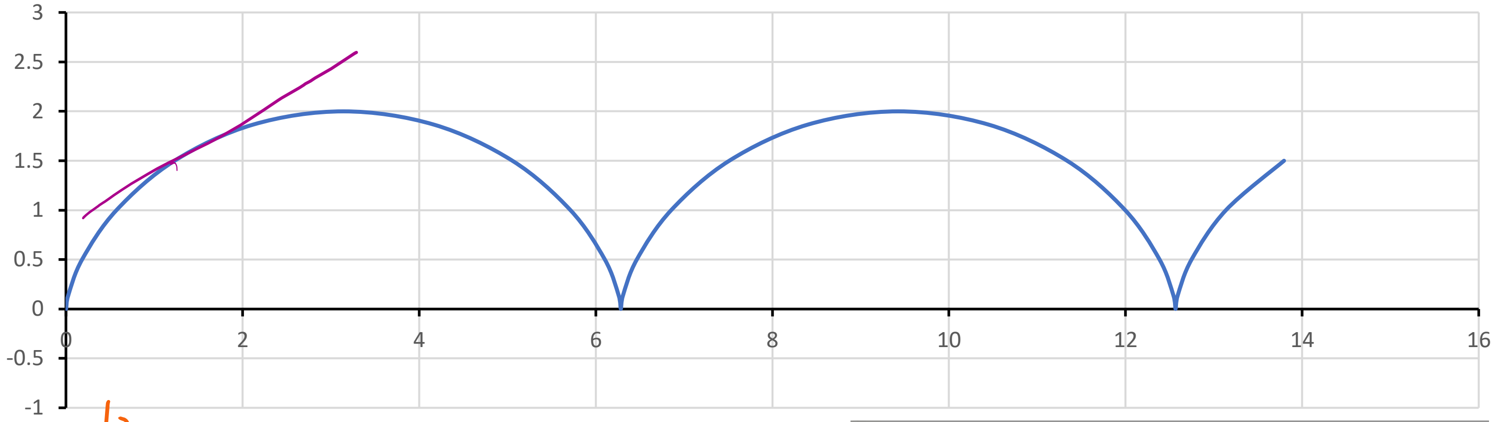
$$t=\sqrt{3} \Rightarrow \underline{x=3}, \underline{y = (\sqrt{3}^3 - 3\sqrt{3})}$$

$$m = \frac{3t^2-3}{2t} \Rightarrow \frac{6}{2\sqrt{3}} = \sqrt{3} \ , \ -\sqrt{3}$$

$$x = r(\theta - \sin(\theta))$$

$$y = r(1 - \underbrace{\cos(\theta)}_{-\sin\theta})$$

$$\theta = \frac{\pi}{3}$$

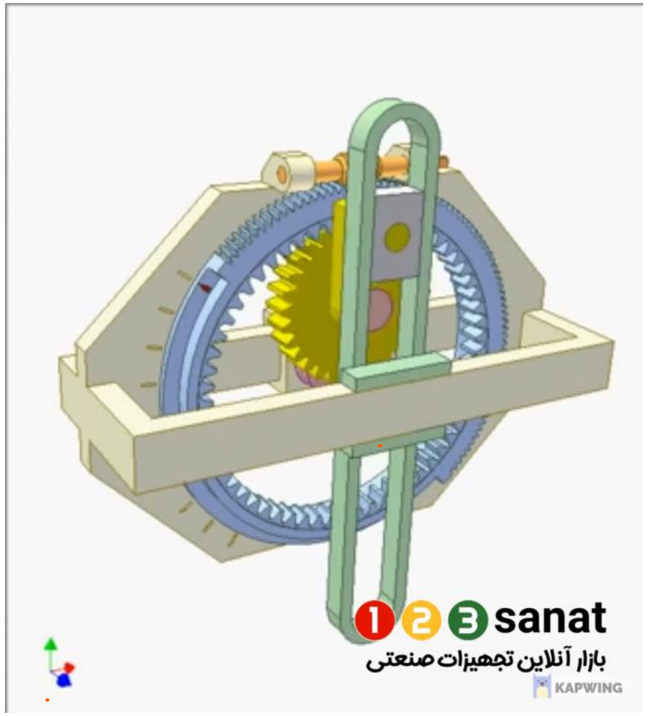


$$m = \frac{dy}{dx} = \frac{\frac{dy}{d\theta}}{\frac{dx}{d\theta}} = \frac{\cancel{r}(\sin\theta)}{\cancel{r}(1-\cos\theta)} = \frac{\frac{\sqrt{3}}{2}}{\frac{1}{2}} = \sqrt{3}$$

x, y

$$x = r\left(\frac{\pi}{3} - \frac{\sqrt{3}}{2}\right), \quad y = r\left(\tfrac{1}{2}\right) \quad \frac{r}{2}$$

$$y - \frac{r}{2} = \sqrt{3}\left(x - r\left(\frac{\pi}{3} - \frac{\sqrt{3}}{2}\right)\right)$$



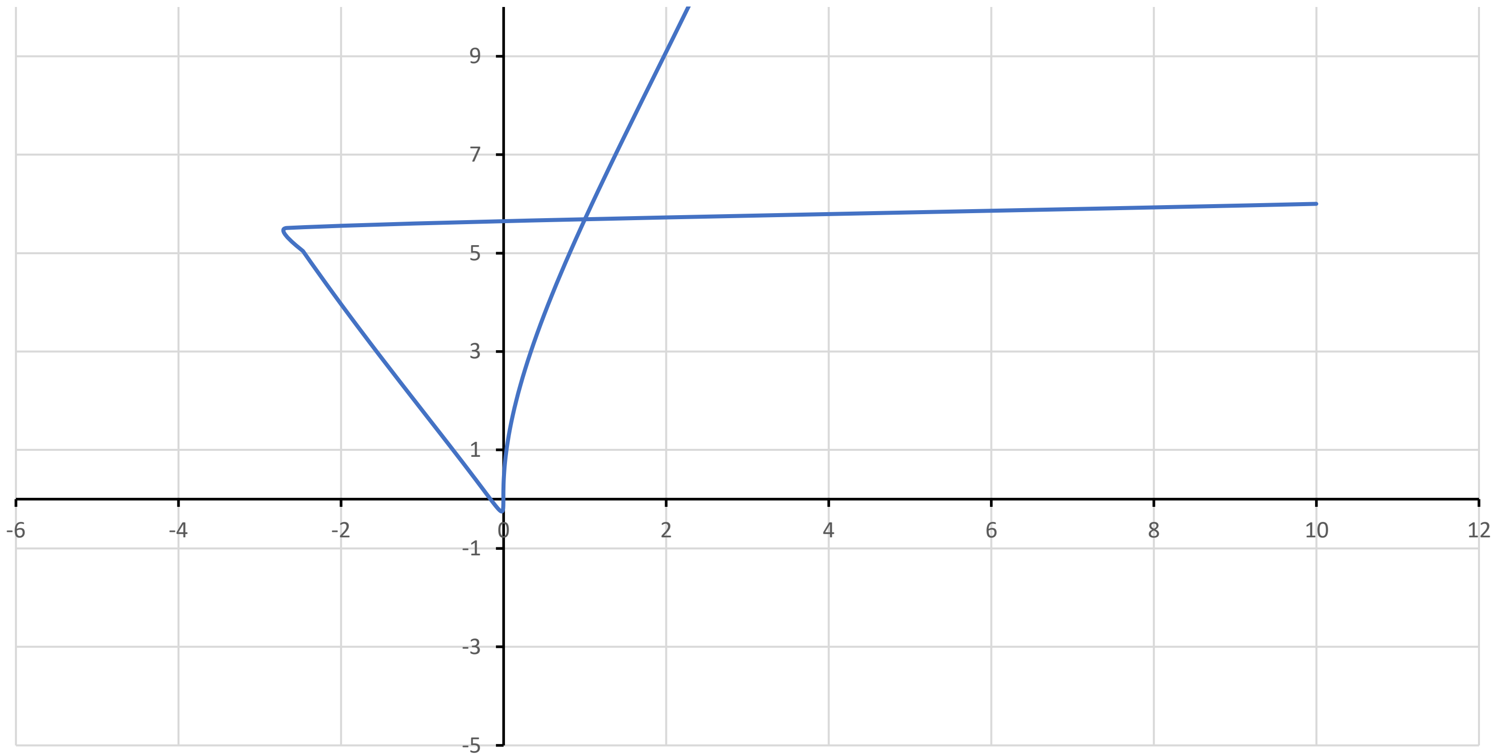
$$x = t^2 + 1$$

$$y = t^2 + t$$

$$\frac{d^2y}{dx^2} = \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

$$\frac{dy}{dx} = \frac{\frac{dy}{dt}}{\frac{dx}{dt}} = \frac{2t+1}{2t}$$

$$\frac{d^2y}{dx^2} = \frac{\frac{d}{dt}\left(\frac{\frac{dy}{dt}}{\frac{dx}{dt}}\right)}{\frac{dx}{dt}} = \frac{\frac{\overset{4t}{2(\cancel{2t})} - \overset{-4t}{2(2t+1)}}{(2t)^2}}{2t} = \frac{2}{8t^3} = \frac{1}{4t^3} \Rightarrow$$ تقعر



$$x = t^2$$

$$y = t^3 - 3t$$

$$\frac{d^2y}{dx^2} = ?\ \frac{d}{dx}\left(\frac{dy}{dx}\right)$$

$$\frac{dy}{dt} = 3t^2 - 3 \qquad \frac{dx}{dt} = 2t$$

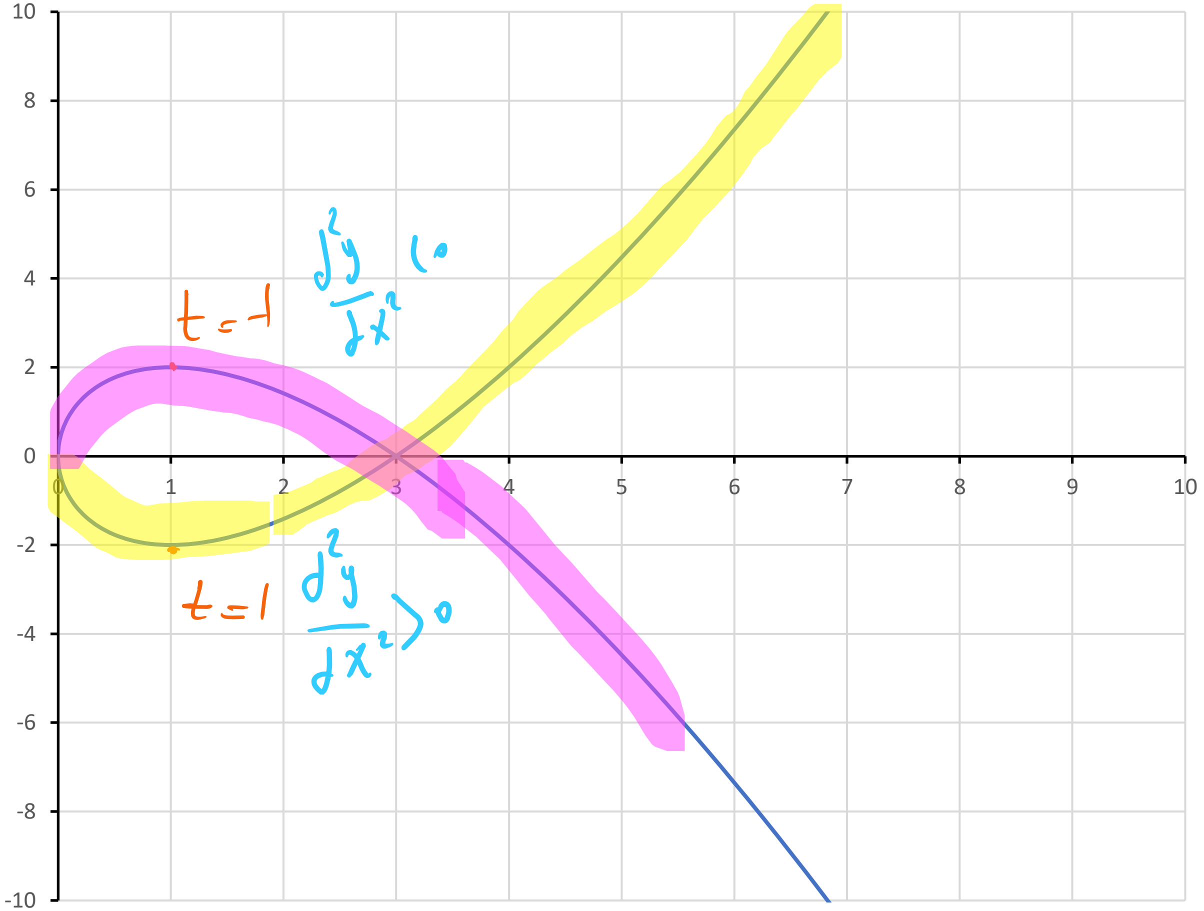
$$\frac{dy}{dx} = \frac{3t^2-3}{2t} \xrightarrow{\frac{d}{dt}} \frac{\overset{12t^2}{6t(2t)} - \overset{-6t^2+6}{2(3t^2-3)}}{4t^2}$$

$$= \frac{6t^2+6}{4t^2}$$

$$\frac{dx}{dt} = 2t$$

$$\frac{d^2y}{dx^2} = \frac{\frac{6t^2+6}{4t^2}}{2t} = \frac{6(t^2+1)}{8t^3} = \frac{3(t^2+1)}{4t^3}$$

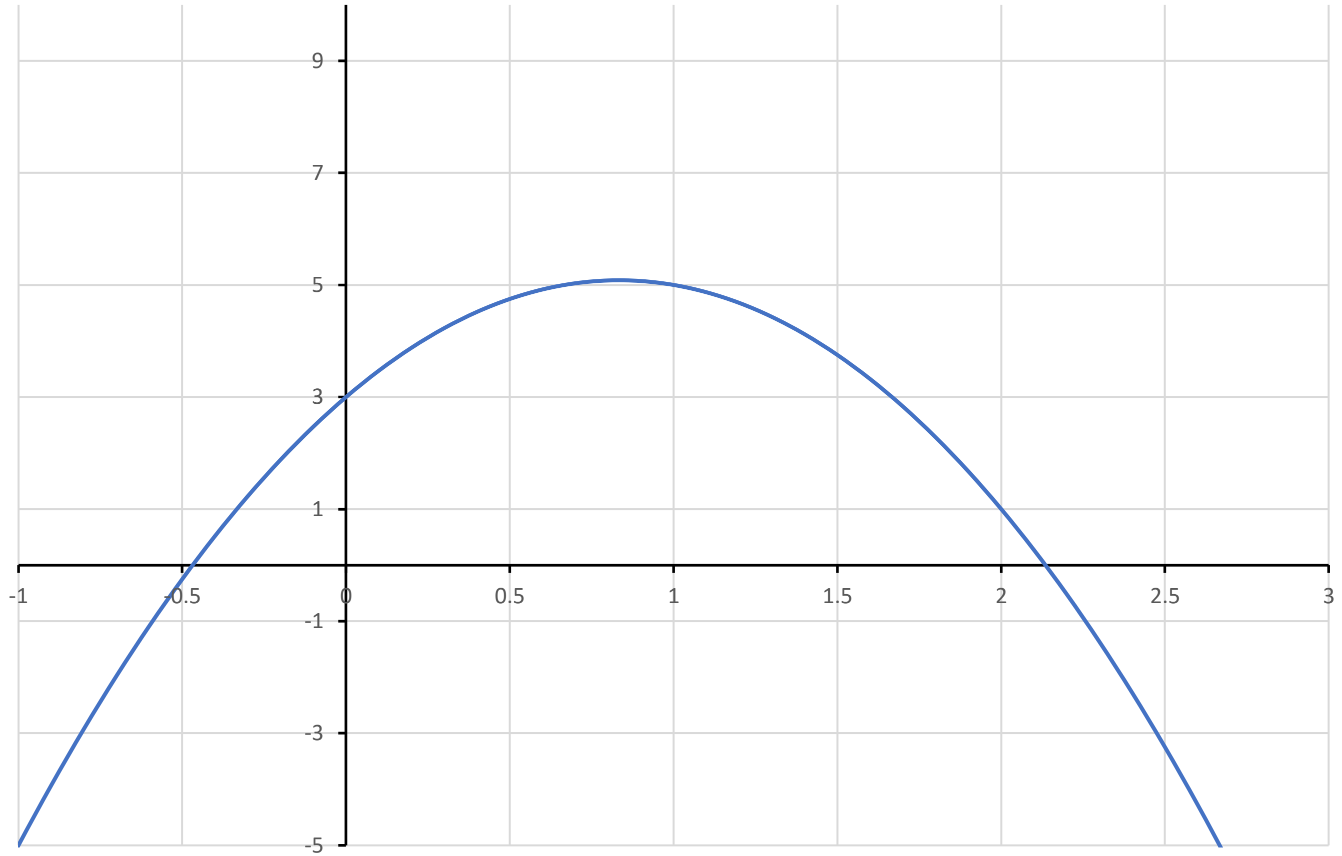
$+$



$$A = \int_a^b y\,dx = \int_\alpha^\beta g(t)f'(t)dt$$

$x = f(t)$ => $dx = f'(t)dt$

$y = g(t)$



$$A = \int_a^b y\,dx = \int_\alpha^\beta \overline{g(t)} f'(t)\,dt$$

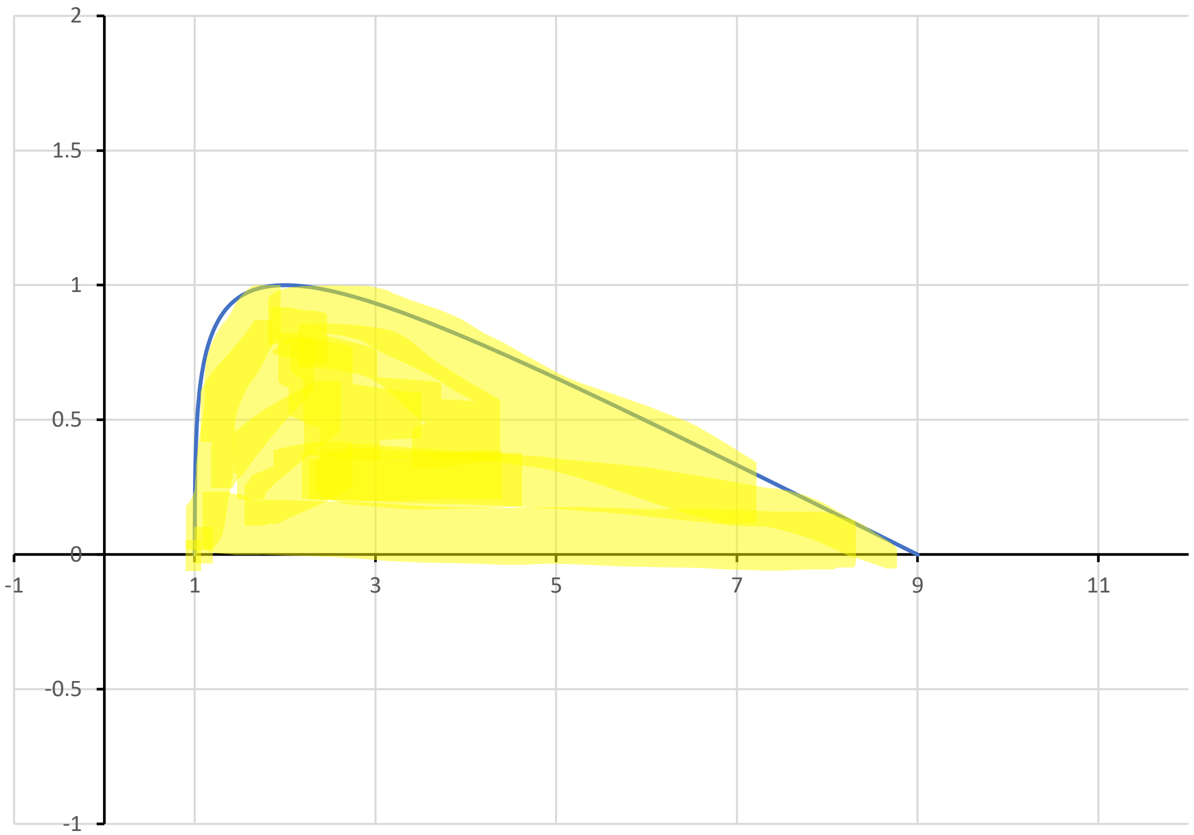
$x = t^3 + 1 \Rightarrow dx = 3t^2\,dt$

$0 < t < 2$

$y = 2t - t^2$

$A = \int_0^2 (2t - t^2)\, 3t^2\, dt = 3\int_0^2 (2t^3 - t^4)\, dt$

$= 3\left[\frac{2t^4}{4} - \frac{t^5}{5}\right]_0^2 = \frac{24}{5}$

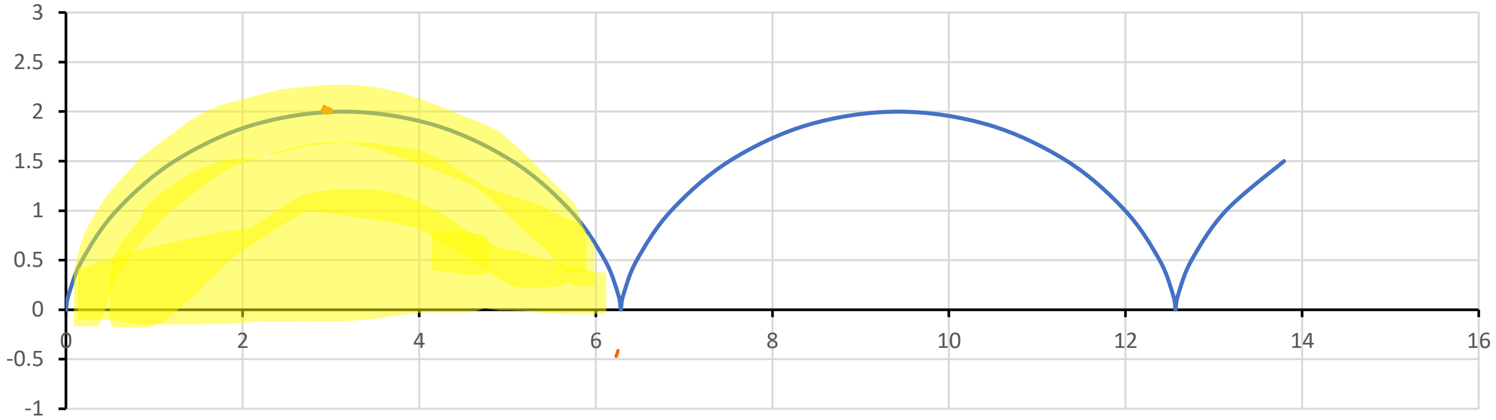


$$x = r(\theta - \sin(\theta))$$

$$dx = r(1 - \cos\theta)\, d\theta$$

$$y = r(1 - \cos(\theta))$$

$$0 < \theta < 2\pi$$



$$A = \int y\, dx = \int_0^{2\pi} g(\theta)\, f'(\theta)\, d\theta$$

$$A = \int r^2 (1 - \cos\theta)(1 - \cos\theta)\, d\theta$$

$$A = r^2 \int (1 - \cos\theta)^2 d\theta = r^2 \int_0^{2\pi} (1 + \underbrace{\cos^2\theta}_{\frac{1}{2}(1+\cos 2\theta)} - 2\cos\theta)\, d\theta = r^2 \left[\frac{3}{2}\theta + \frac{1}{2}\left(\frac{1}{2}\sin 2\theta\right) - 2\sin\theta\right]_0^{2\pi}$$

$$\Downarrow$$

$$r^2 \int_0^{2\pi} \left[\frac{3}{2} + \frac{1}{2}\cos 2\theta - 2\cos\theta\right] d\theta$$

$$= r^2 \left[\frac{3}{2}(\right.$$