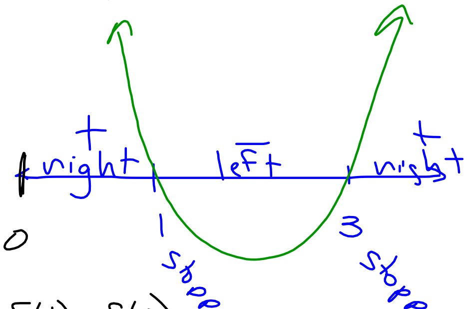
$3t^2-12t+9$

$3(t^2-4t+3)=0$



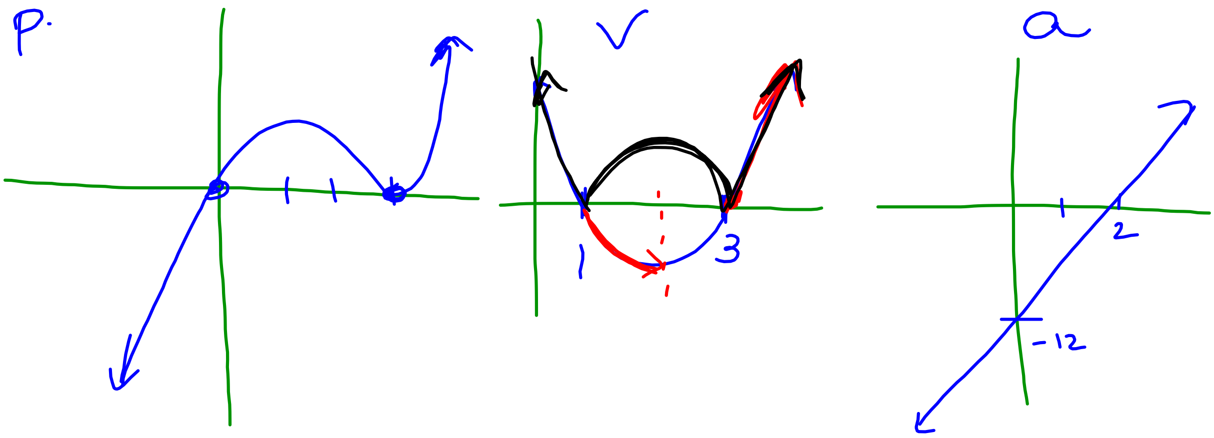

$S(1)-S(0)$ $\quad$ $S(3)-S(1)$ $\quad$ $S(5)-S(3)$

$t(t-3)^2$

$4-0$ $\quad$ $|0-4|$ $\quad$ $20-0$

$4 + 4 + 20$

$=28$ m




$t(t^2-6t+9)$

$t(t-3)^2$

## 3.6 Repeated Chain Rule

Find the derivatives of the following functions:

$$g(t)=\tan(5-\sin 3t)$$

$$3(-\cos 3t)\cdot \sec^2(5-\sin 3t)$$

$$f(x)=\sqrt{1+\cos^2(3x)}$$

$$\left(1+\boxed{(\cos(3x))^2}\right)^{\frac{1}{2}}$$

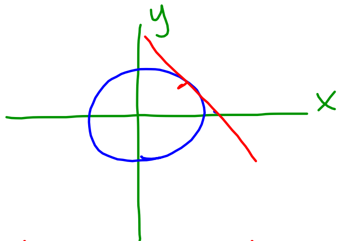
$$\cancel{\tfrac{1}{2}}\left(1+(\cos(3x))^2\right)^{-\frac{1}{2}}\left(\cancel{2}(\cos(3x))^1(-\sin 3x)\right)3$$

$$-3\cos(3x)\sin(3x)\left(1+(\cos(3x))^2\right)^{-\frac{1}{2}}$$

$$h(x)=(\underline{\sin(x^3-2x)}+\cos(4x))^4$$

$$\cancel{4}\left(\underline{\sin(x^3-2x)+\cos(4x)}\right)^3\left(4\cos(x^3-2x)\underline{(3x^2-2)}-16\sin(4x)\right)$$

## Chain Rule for Parametrics:



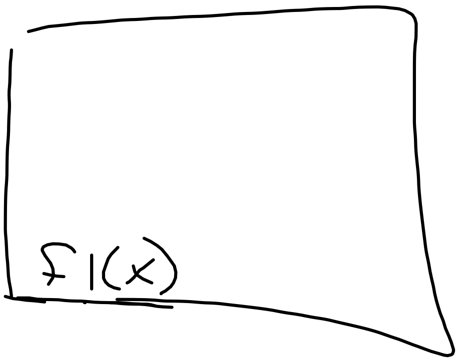

$$\text{slope} = \frac{dy}{dx}=\frac{\frac{dy}{dt}}{\frac{dx}{dt}}$$

Find the tangent to the circle defined by:

$$x(t)=\cos t \qquad y(t)=\sin t \qquad \text{at } t=\frac{\pi}{4} \qquad \left(\frac{\sqrt{2}}{2}, \frac{\sqrt{2}}{2}\right)$$

$$\frac{dy}{dx}=\frac{\frac{dy}{dt}}{\frac{dx}{dt}}=\left.\frac{\cos t}{-\sin t}\right|_{t=\frac{\pi}{4}}=\frac{\frac{\sqrt{2}}{2}}{-\frac{\sqrt{2}}{2}}=-1$$

$$y=-1\left(x-\frac{\sqrt{2}}{2}\right)+\frac{\sqrt{2}}{2}$$

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Find the tangent to the hyperbola branch defined by:

$$x(t) = \sec t \qquad -\frac{\pi}{2} < t < \frac{\pi}{2} \qquad \text{at } t = \frac{\pi}{4}$$

$$y(t) = \tan t$$

$$\frac{dy}{dx} = \frac{\sec^{\cancel{2}} t}{\cancel{\sec t}\,\tan t}\Bigg|_{t=\frac{\pi}{4}}$$