2.1, 2.3, 2.4, 2.5.

tinyurl.com/apexcalculus.

$$\boxed{y = 7^{2x+1}}$$

$$\frac{d}{dx}(e^x) = e^x$$

$$= \left(e^{\ln(7)}\right)^{(2x+1)}$$

$$= e^{\ln(7)(2x+1)}$$

by chain rule

So $$\frac{dy}{dx} = e^{\ln(7)(2x+1)} \cdot (2\ln(7)),$$

$$= 7^{2x+1} \cdot 2\ln(7)$$

$$y = \sin(7)^{2x+1}.$$

$$y' = \sin(7)^{2x+1} \cdot 2 \cdot \ln(\sin(7))$$

Q16.

$$j(\theta) = \cot(\theta^2 - 5).$$

$$= \frac{1}{\tan(\theta^2-5)}$$

$$j'(\theta) = \frac{-1}{\tan^2(\theta^2-5)} \left(\tan^2(\theta^2-5) + 1\right)(2\theta)$$

$$= \frac{-2\theta\tan^2(\theta^2-5) - 2\theta}{\tan^2(\theta^2-5)}$$

$$= -2\theta\left(1 + \frac{1}{\tan^2(\theta^2-5)}\right)$$

$$= -2\theta\left(1 + \cot^2(\theta^2-5)\right)$$

Q23

$$h(t) = 3^t$$

$$h'(t) = 3^t \cdot \ln(3).$$

$$h(t) = 3^t$$

$$= \left(e^{\ln(3)}\right)^t$$

$$= e^{\ln(3)t}$$

So $h'(t) = e^{\ln(3)t} \cdot (\ln(3))$

$$= 3^t \cdot \ln(3)$$

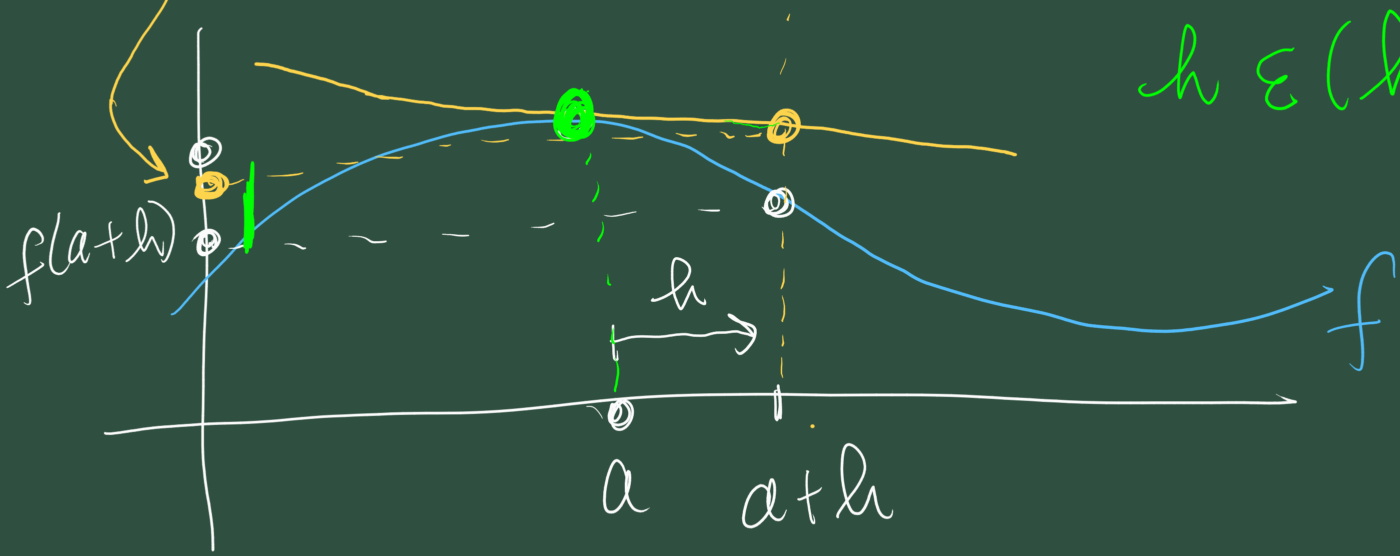
Quantity = approximation + error
or
correction.

Quantity ≈ approx.

$$f(a+h) \approx \boxed{f(a) + \underbrace{hf'(a)}_{\substack{\text{derivative} \\ df}}} \to 0$$

$f(a)$

$$+ \underbrace{\text{error}(h)}_{h\,\varepsilon(h)}$$



where $\varepsilon(h) = \dfrac{f(a+h) - f(a)}{h} - f'(a)$

$\longrightarrow 0$ as $h \to 0$.

$$\boxed{f(x) \longrightarrow L \quad \text{as} \quad x \longrightarrow a}$$

$\hookrightarrow \forall \varepsilon > 0 \; \exists \delta > 0$ s.t.

$$|x-a| < \delta \Rightarrow |f(x) - L| < \varepsilon$$