out of sequence (from §2.3)

$\lim_{h\to 0} \frac{f(x+h)-f(x)}{h} = f'(x)$ = slope function

= derivative function

$= \frac{df}{dx} = \frac{dy}{dx}$ = Liebniz Notation.

$m = \frac{\Delta y}{\Delta x} \longrightarrow \frac{dy}{dx}$

$\frac{d}{dx}$ = derivative operator

= derivative with respect to x.

= how much y changes with an incremental change in x.

$\frac{d}{dx}[g]$

1st videos of §2.1 cover (briefly)

power rule $\frac{d}{dx}[x^n] = nx^{n-1}$

sum (difference) rule

product rule

quotient rule

$\frac{d}{dx}[x^2] = 2x$

$\frac{d}{dx}[\sqrt[5]{x^7}] = \frac{d}{dx}[x^{\frac{7}{5}}] = \frac{7}{5}x^{\frac{2}{5}}$

$= \frac{7}{5}\sqrt[5]{x^2}$

$\sqrt{x}$

$\sqrt{x^2-5x}$

Chain Rule : $\frac{d}{dx}[f(g(x))]$

$= \frac{df}{dg} \cdot \frac{dg}{dx}$

$h(x) = \sqrt{x^2-5x} = (x^2-5x)^{\frac{1}{2}}$

$g(x) = x^2-5x = u(x)$

$f(u) = u^{\frac{1}{2}}$

$\frac{df}{dg} = \frac{1}{2}g(x)^{-\frac{1}{2}}$

$\frac{dg}{dx} = 2x-5$

$\frac{dh}{dx} = \frac{df}{dg} \cdot \frac{dg}{dx} = \frac{1}{2}(x^2-5x)^{-\frac{1}{2}}(2x-5)$

$\frac{1}{3} - 1 = -\frac{2}{3}$

$\frac{d}{dx}\left[(x^3-4x)^{\frac{1}{3}}\right] = \frac{1}{3}(x^3-4x)^{-\frac{2}{3}}(3x^2-4)$

outside-in.

Falling Bodies

Position $h(t) = \frac{1}{2} g t^2 + v_0 t + h_0$

Velocity: $gt + v_0$

Accel: g

$= -16t^2 + v_0 t + h_0$ English

$= -4.9t^2 + v_0 t + h_0$ Metric

↑

$(9.81)(\frac{1}{2})$ is better

4.905

The $\frac{1}{2}t^2$ comes from an ANTIDERIVATIVE

what has derivative of t?

Marginal Cost:

Economists say this is the cost of one additional unit of production.

Mathematicians say it's the slope of the cost curve.

$$\lim_{h \to 0} \frac{f(100+h) - f(100)}{h}$$

Generally pretty close

$$\frac{F(100) - F(99)}{1} = F(100) - F(99)$$