Lecture 12

Thursday, October 20, 2022 11:47 PM

*Questions

Indefinite forms: $\frac{0}{0}$, $\frac{\infty}{\infty}$, $\infty - \infty$, 0∞, 1^{∞}

Most meaningful problems in real life involve limits of an indefinite form.

Ex Car has speedometer and milage (measured by wheel rotation)

$s = s(t)$
↑ milage ↑ time

$\frac{s(3)-s(1)}{3-1}$ = average speed between times 1 and 3.

$\frac{s(1.001)-s(1)}{1.001-1}$ = average speed between times 1 and 1.001.

This is almost a real-time speed.

Real-time (or instantaneous) speed $= \lim_{t \to 1} \frac{s(t)-s(1)}{t-1}$

$= \lim_{h \to 0} \frac{s(1+h)-s(1)}{h}$

Ex Car has milage $s(t) = t^2 + t$ What is the instantaneous speed at $t = 2$?

$$s(2+h) = (2+h)^2 + (2+h) = h^2 + 5h + 6$$

$$s(2) = 6$$

$$s(2+h) - s(2) = h^2 + 5h$$

$$\frac{s(2+h) - s(2)}{h} = \frac{h^2+5h}{h} = h + 5 \xrightarrow{h \to 0} \boxed{5}$$