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MAT 122ReviewLet $f(t)$ denote displacement at time t Average velocity on an interval $[a, b]$:

$$V_{\text{AVE}} = \frac{f(b) - f(a)}{b - a} = \text{slope of secant line}$$

Instantaneous velocity at a time $t = a$:

$$v = \lim_{x \rightarrow a} \frac{f(x) - f(a)}{x - a} = \text{slope of tangent line}$$

Suppose an object's displacement is recorded as a function of time:

t	0	0.5	0.75	0.85	0.9	0.99	0.999	1
$f(t)$	0	0.125	0.4219	0.6141	0.729	0.9703	0.997	1
V_{AVE} on $[t, 1]$	1	1.75	2.3124	2.5727	2.71	2.97	2.997	

The inst. velocity at time $t = 1$ appears to be _____

Let's check:

$$\lim_{x \rightarrow 1} \frac{x^3 - 1^3}{x - 1} = \dots = \underline{\hspace{2cm}}$$

Alternate formulations of inst. velocity: (at $t = a$)

$$v = \lim_{h \rightarrow 0} \frac{f(a+h) - f(a)}{h}$$

$$= \lim_{t \rightarrow a} \frac{f(t) - f(a)}{t - a} = \lim_{t \rightarrow a} \frac{f(a) - f(t)}{a - t}$$