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1. Humbard's tower in Cuyahoga Falls is 494 feet tall. As you know, Mitch dropped a ball off the top of the tower. (He still won't say how he got up there.) After  $t$  seconds the ball had fallen approximately

$$s(t) = 16t^2 \text{ feet, } 0 \leq t \leq \sqrt{30.875}.$$

24 pts
24.

- (a) What was the average speed of the ball over the first second ( $0 < t < 1$ )?

$$\frac{16}{1} = 16 \text{ ft/s } \checkmark$$

- (b) What was the instantaneous speed of the ball at time 1 second?

$$\lim_{h \rightarrow 0} \frac{f(t+h) - f(t)}{h} = \lim_{h \rightarrow 0} \frac{16(t+h)^2 - 16t^2}{h} = \lim_{h \rightarrow 0} \frac{16t^2 + 32th + h^2 - 16t^2}{h} = \lim_{h \rightarrow 0} \frac{h(32t+h)}{h} = 32(t) \quad t=1$$

$$\boxed{32 \text{ ft/s } \checkmark}$$

2. Suppose that  $\lim_{x \rightarrow a} f(x) = 0$ ,  $\lim_{x \rightarrow a} g(x) = 2$ ,  $\lim_{x \rightarrow a} h(x) = 0$ .

For each limit below, circle whether the limit is a finite number (exists), does not exist (d.n.e.), or there is not enough information given to know whether or not the limit exists (indeterminate).

6 pts
6

(a)  $\lim_{x \rightarrow a} \frac{f(x)}{g(x)} = \frac{0}{2}$

EXISTS  $\checkmark$

D.N.E

INDETERMINATE

(b)  $\lim_{x \rightarrow a} \frac{g(x)}{f(x)} = \frac{2}{0}$

EXISTS

D.N.E  $\checkmark$

INDETERMINATE

(c)  $\lim_{x \rightarrow a} \frac{f(x)}{h(x)} = \frac{0}{0}$

EXISTS

D.N.E

INDETERMINATE  $\checkmark$

(OVER)

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