Mathematics 122 Quiz 7 Name: Key

A rock is dropped from the top of a tall building. If t is the time in seconds since it was dropped, the distance it has fallen is

$$s(t) = 16t^2 \text{ ft.}$$

We will determine the instantaneous rate of change when $t = 2$ sec.

1 pt (1) What is the average rate of change (that is the average speed) between $t = 2$ and $t = 2.1$ seconds?

$\frac{\Delta s}{\Delta t} = \frac{s(2.1) - s(2)}{2.1 - 2}$

$= (16(2.1)^2 - 16(2)^2)/.1 =$ $\frac{\Delta s}{\Delta t} =$ 65.6

1 pt (2) What is the average speed between $t = 2$ and $t = 2.01$ seconds?

$\frac{\Delta s}{\Delta t} = \frac{s(2.01) - s(2)}{2.1 - 2}$

$= (16(2.01)^2 - 16(2)^2)/.01 =$ $\frac{\Delta s}{\Delta t} =$ 64.16

2 pts (3) Find and simplify the formula for the average speed between $t = 2$ and $t = 2 + h$.

$\frac{\Delta s}{\Delta t} = \frac{s(2+h) - s(2)}{h}$ $\frac{\Delta s}{\Delta t} =$ $64 + 16h.$

$= \frac{16(2+h)^2 - 16(2)^2}{h}$

$= \frac{16(4 + 4h + h^2) - 16(4)}{h}$

$= \frac{64 + 64h + 16h^2 - 64}{h}$

$= \frac{h(64 + 16h)}{h} = 64 + 16h$

1 pt (4) What is the instantaneous speed when $t = 2$? (You find this by letting $h = 0$ in your answer to the last question.)

If $h = 0$ in (3) then we get → $s'(2) =$ 64