

Section 2.1

Solutions and Hints

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for the book:
Calculus, Early Vectors
by James Stewart.

11. The displacement in feet of a particle moving in a straight line is given by $s = t^3 / 6$, where t is measured in seconds.

11a. Find the average velocity over the following time periods:
[1, 3], [1, 2], [1, 1.5], [1, 1.1]

Average Velocity = (distance traveled) / (time elapsed)

Time period	Equation	Average Velocity
[1, 3]	$\frac{s(3) - s(1)}{3 - 1} = \frac{4.5 - (1/6)}{2}$	$\frac{13}{6}$ ft / sec
[1, 2]	$\frac{s(2) - s(1)}{2 - 1} = \frac{(4/3) - (1/6)}{1}$	$\frac{7}{6}$ ft / sec
[1, 1.5]	$\frac{s(1.5) - s(1)}{1.5 - 1} = \frac{(9/16) - (1/6)}{0.5}$	$\frac{19}{24}$ ft / sec
[1, 1.1]	$\frac{s(1.1) - s(1)}{1.1 - 1} = \frac{(1331/6000) - (1/6)}{0.1}$	$\frac{331}{600}$ ft / sec

11b. Find the instantaneous velocity when $t = 1$.

Notice from part (a) we can see that the closer our interval gets to being [1, 1], or rather the smaller our time step gets, we see that the average velocity gets closer and closer to $\frac{1}{2}$ ft / sec. Thus we conclude:

The instantaneous velocity at $t = 1$ is $\frac{1}{2}$ ft / sec.

Parts (c) and (d) are left for you and a good calculator.