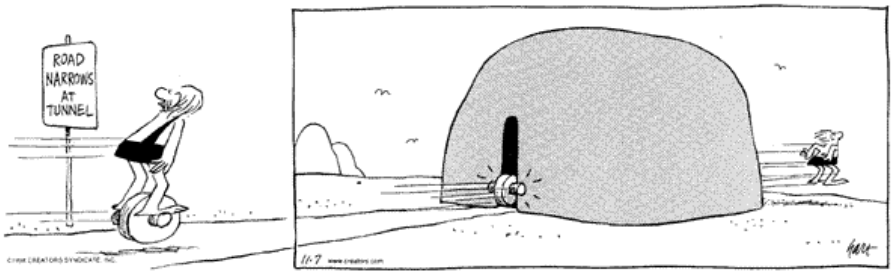
September 14, 2011 Physics 131 Prof. E. F. Redish

- **Theme Music:** Soul II Soul
  Keep on Movin'
- **Cartoon:** Johnny Hart
  BC



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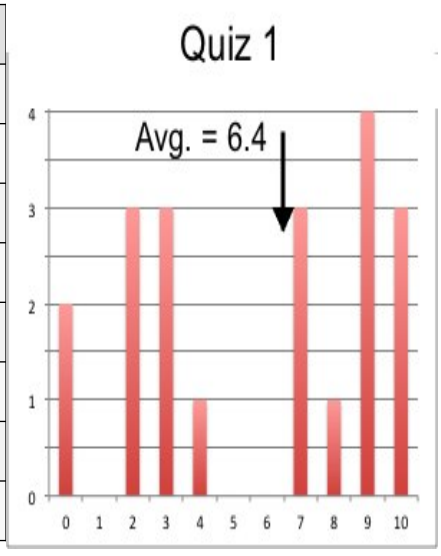
Quiz 1

	1.1	1.2	1.3
a	10%	0%	0%
b	15%	30%	75%
c	65%	15%	15%
d	5%	35%	65%
e		5%	0%
f		10%	
g		0%	
h		25%	



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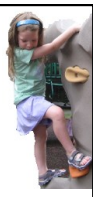
Foothold ideas: Acceleration



- Average acceleration is defined by

$$\langle \vec{a} \rangle = \frac{\Delta \vec{v}}{\Delta t} = \frac{\text{change in velocity}}{\text{time it took to do it}}$$

Note: an average acceleration goes witha time interval.

- Instantaneous acceleration is what we get when we consider a very small time interval (compared to times we care about)

$$\vec{a} = \frac{d\vec{v}}{dt}$$

Note: an instantaneous acceleration goes with a specific time.

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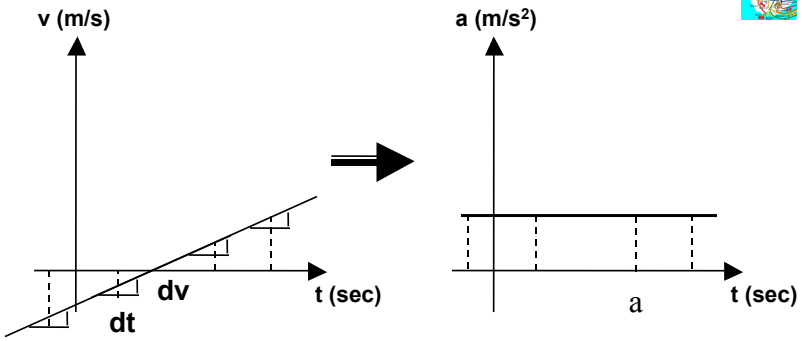
Velocity to acceleration



$$a(t) = \frac{dv}{dt}$$

$$a(t) = \frac{v(t + \Delta t/2) - v(t - \Delta t/2)}{\Delta t}$$

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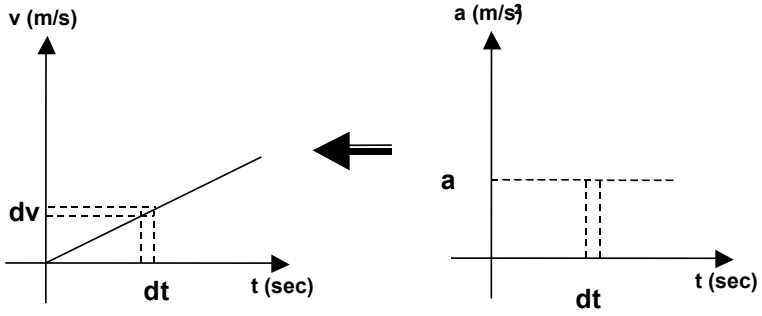
Acceleration to velocity



$$dv = a(t)\,dt$$

change in velocity over a small time interval

sum ("Δ") in the changes in velocity over many small time intervals.

$$v = \sum dv = \int a(t)\,dt$$

What have we learned?

- Position $\hat{r} = x\hat{i} + y\hat{j}$ (where x and y are signed lengths)
- Velocity $\langle \vec{v} \rangle = \frac{\Delta \vec{r}}{\Delta t}$ $\vec{v} = \frac{d\vec{r}}{dt}$
- Acceleration $\langle \vec{a} \rangle = \frac{\Delta \vec{v}}{\Delta t}$ $\vec{a} = \frac{d\vec{v}}{dt}$
- Seeing from the motion
- Seeing consistency (graphs & equations)