Velocity and Distance

Source: Kenneth Kuttler (2009) *Calculus, Applications and Theory*

V (velocity)	Measure the speed, km/hr(km per hour) The velocity is the slope of the distance graph $$slope = \frac{change\ in\ distance}{change\ in\ time} = \frac{vt}{t} = v$$ The graph of *v* is "piecewise constant." The total area under the v-graph is $f_{last} - f_{first}$ or $f(t_{end}) - f(t_{start})$ The acceleration is the slope of the velocity curve.
The average velocity	is the slope of a straight line. $$Average\ velocity = \frac{change\ in\ f}{change\ in\ t}$$
Circular velocity	The upward velocity is $v = cos\ t$ $$Average\ velocity = \frac{change\ in\ sin\ t}{change\ in\ t} = \frac{sin(t+h) - sin(t)}{h}$$
F (distance)	Distance traveled (km) The distance f is the area under the v-graph. The slope of the f-graph is $$slope = \frac{change\ in\ f}{change\ in\ t}$$ Between the breakpoints, the slope of f(t) is v(t). The graph of *f* is *"piecewise linear."*
	If **v** is constant and f starts at zero then f =**vt.** When v is constant, the region under the graph is a rectangle. Its height is v, its width is t, and its area is v times t.
	The slope of the f-graph gives the velocity v. The area under the v-graph gives the distance **f.**
	When the distance is $f(t) = sin t$, the velocity is $v(t) = cos t$ When the distance is $f(t) = cos t$, the velocity is $v(t) = -sin\ t$
Functions of Velocity and Distance	$v(t)$ is the value of the function v at the time t. The time t is the input to the function. The velocity v(t) at that time is the output. $f(t)$ is the distance at time t. The differences of the f's add up to $(f_{last} - f_{first})$
Domain and Range	The domain of a function is the set of inputs. The range is the set of outputs.