## Classical Mechanics 3 The general vector version of newton's second law is: mr = F(r,r,t,...) this is only for one particle. It is both a differential equation and a vector equation. This is equivalent to there I-dimensional equations $m\ddot{x} = F_{x}(x,y,z,\dot{x},\dot{y},\dot{z},\dot{t},...)$ my = Fy(x,y,z,z,t,,) m2 = Fz(x,y,z,x,y,z,ton) These can only be solved analytically in very simple examples. Often we have to use computers to solve them. But we all also have to deal with chaos theory. Fortunately, we like simple examples and we can still learn a lot from them. Motion in 10

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The velocity v can be both positive onch negative, but the speed IVI is only positive.

From now on, we rarely assume ameloration to be constent.

Analysis in 10 can be more useful than are

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Change in momentum = impulse	$m \left( \frac{dV(t)}{dt} = \right) F(t)$	-
Change in momentum = impulse	ti Cit	
Change in momentum = impulse	$m[v(t)]_{t} = (t+t)$	
	change in momentum = impulse	
This equation works even when the force is not constant.		
is not constant.	This equation works even when the force	
	is not constant.	

Impulse is useful for collisions. You may not know enough to coort out F(E) in detail, but the impulse on be found from the charge in momentum, which is easier to measure Collisions do not usually conserve kinetic energy, the but the impulse = D(momentum) is 10 Motion with a velocity-dependent force F = F(v) · eq. air resistance, fluid friction mat = F(v) (Law 2) Example - Fluid friction F(v) = - XV Ok approx. When v is small  $M = - \propto V$   $= - \propto V$ Vat = - m we've used a mathmatical trick - dv = - = dt Judy = J- mat characteristic In Vi = \$ - & t V, = Voe mt

