

Math 135 - Winter 2000

Homework to be done by February 24th

Homework to be done by March 9th

Section 9.6: Problems 3, 13, 19, 27, 29, 34(a).

Section 13.1: Problems **Section 13.2:** Problems **Section 13.3:** Problems **Section 9.8:** Problems 3, 5, 9, 21, 42.

Section 13.4: Problems

1. Let $\mathbf{r}(t)$ denote the position of a moving particle in 3-space at time t . Also, let $\mathbf{v}(t) = d\mathbf{r}/dt$ be its velocity, $v(t) = \|\mathbf{v}(t)\|$ its speed, and $\mathbf{a}(t) = d\mathbf{v}/dt$ its acceleration. Assume that the speed is never zero.
 - 1.1. Show that the derivative of the speed is the component of the acceleration in the direction of motion:

$$\frac{dv}{dt} = \text{comp}_{\mathbf{v}(t)} \mathbf{a}(t).$$

- 1.2. Show that the speed is constant if and only if $\mathbf{a}(t) \perp \mathbf{v}(t)$ for all t .
2. Find the length of the curve

$$\mathbf{r}(t) = [\log t]\mathbf{i} + [\log(4 - t)]\mathbf{j} + \left[\int_1^t \frac{\sqrt{8s - 2s^2}}{s(4 - s)} ds \right] \mathbf{k}, \quad 1 \leq t \leq 2.$$