

1. Consider a valley whose height  $h$  in meters is given by  $h = \frac{x^2}{10} + \frac{y^2}{10}$ , with  $x$  and  $y$  (and 10!) in meters. Suppose you are hiking through this valley on a trail given by

$$x = 3t \quad y = 2t^2$$

with  $t$  in seconds (and where “3” and “2” have appropriate units).

- (a) How fast are you climbing (rate of change of  $h$ ) *per meter* along the trail when  $t = 1$ ?  
*You may find it helpful to recall that  $ds = |d\vec{r}|$ .*

- (b) How fast are you climbing *per second* when  $t = 1$ .

2.

- (a) For each vector field  $\vec{F}$  shown below, sketch a curve for which the integral  $\int_C \vec{F} \cdot d\vec{r}$  is positive.

- (b) For which of these vector fields is it possible to choose your curve to be closed?

