

**Skills check** (not to turn in):

(a) §14.5: 34

(b) The voltage  $V$  (in volts) across a circuit is given by Ohm's law:  $V = IR$ , where  $I$  is the current (in amps) flowing through the circuit and  $R$  is the resistance (in ohms). If we place two circuits, with resistance  $R_1$  and  $R_2$ , in parallel, then their combined resistance  $R$  is given by

$$\frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

Suppose the current is 2 amps and increasing at  $10^{-2}$  amp/sec and  $R_1$  is 3 ohms and increasing at 0.5 ohm/sec, while  $R_2$  is 5 ohms and decreasing at 0.1 ohm/sec. Calculate the rate at which the voltage is changing.

*SUGGESTION: Use differentials!*

**Assigned:**

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  $t = 1$ .