In-class Activity 9

Related rates

Question 1 A metallic disk is expanding under the influence of heat at a rate of $4\,cm^2/s$. At what rate is the radius increasing when the diameter is $8\,cm$?

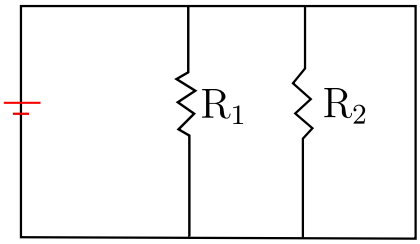
Question 2

Pikachu and Slowpoke are chatting when a pokemon trainer arrives and tries to capture them. Pikachu flees east at a constant speed of $10\,km/h$ while Slowpoke runs north at a constant speed of $1\,km/h$. At what rate is the distance between the two pokemon increasing after 30 minutes ?

Question 3
Queen bee is flying following the path described by the circle $x^2 + y^2 = 4$. What is the x component of the velocity at the point $(\sqrt{2}, \sqrt{2})$ if the y component of the velocity is $1\,m/s$?

Question 4
A spherical balloon is deflating at a rate of $4\pi\,in^3/s$. If the initial volume is $\frac{28}{3}\pi\,in^3$, at what rate is the radius changing after 2 seconds?

Question 5



Above is the picture of an electrical circuit with two resistors R_1 and R_2 connected in parallel. By Ohm's law, the total resistance of the circuit R (measured in Ohms Ω) satisfies the following equation:

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

Suppose the resistances R_1 and R_2 are increasing over time at a rate of $9\,\Omega/s$ and $2\,\Omega/s$ respectively. At what rate is the total resistance R increasing when $R_1 = \frac{3}{2}\,\Omega$ and $R_2 = \frac{1}{3}\,\Omega$?