1. The power delivered by a battery to an apparatus of resistance R (in ohms) is $P = \dfrac{2.25R}{(R+0.5)^2}$ watts. Find the rate of change of power with respect to resistance for $R = 2\Omega$ and $R = 5\Omega$.

2. The position of a particle moving in a straight line is

$$s(t) = t^2 - t + 10\,\text{cm}$$

for $0 \le t \le 5$. Find a time t at which the instantaneous velocity is equal to the average velocity for the entire trip.

3. A particle moving along a line has position $s(t) = t^4 - 18t^2$ m at time t seconds. At which times does the particle pass through the origin? At which times is the particle instantaneously motionless (that is, it has zero velocity)?

4. Let $f(x) = \sqrt{x}$. Find a formula for $f^{(n)}(x)$ for $n \ge 2$.

5. Prove that for all whole numbers $n \ge 1$,

$$\frac{d^n}{dx^n} \sin x = \sin\left(x + \frac{n\pi}{2}\right)$$

6. The power P in a circuit is $P = Ri^2$, where R is the resistance and i is the current. Find dP/dt at $t = \frac{1}{3}$ if $R = 1000\Omega$ and i varies according to $i = \sin(4\pi t)$ (time in seconds).

7. Match functions (A)–(C) with their derivatives (I)–(III) in the following figure.