1. Suppose that a rollercoaster's speed as a function of time in seconds isgiven by

$$v(t) = 40x(x-50)(x-80) \quad \text{m/s}$$

The ride lasts 120 **seconds. Where is it fastest and slowest during that time? Use a sign chart or the second derivative test. Which do you prefer?**

2. Economists are very interested in "marginal rates of return". Roughly, this is the amount a company earns at its current production by increasing production to one more unit. When the production capacity is significant, this function is essentially the derivative of "net profit" as a function of "units produced".

Why would companies likely tend to produce an amount of goods where the marginal rate of return is zero? If the marginal rate of return is given by the following function, how many units would the company probably want to produce:

$$MR(x) = -300x(x-20)(x-100)(x-2000)$$