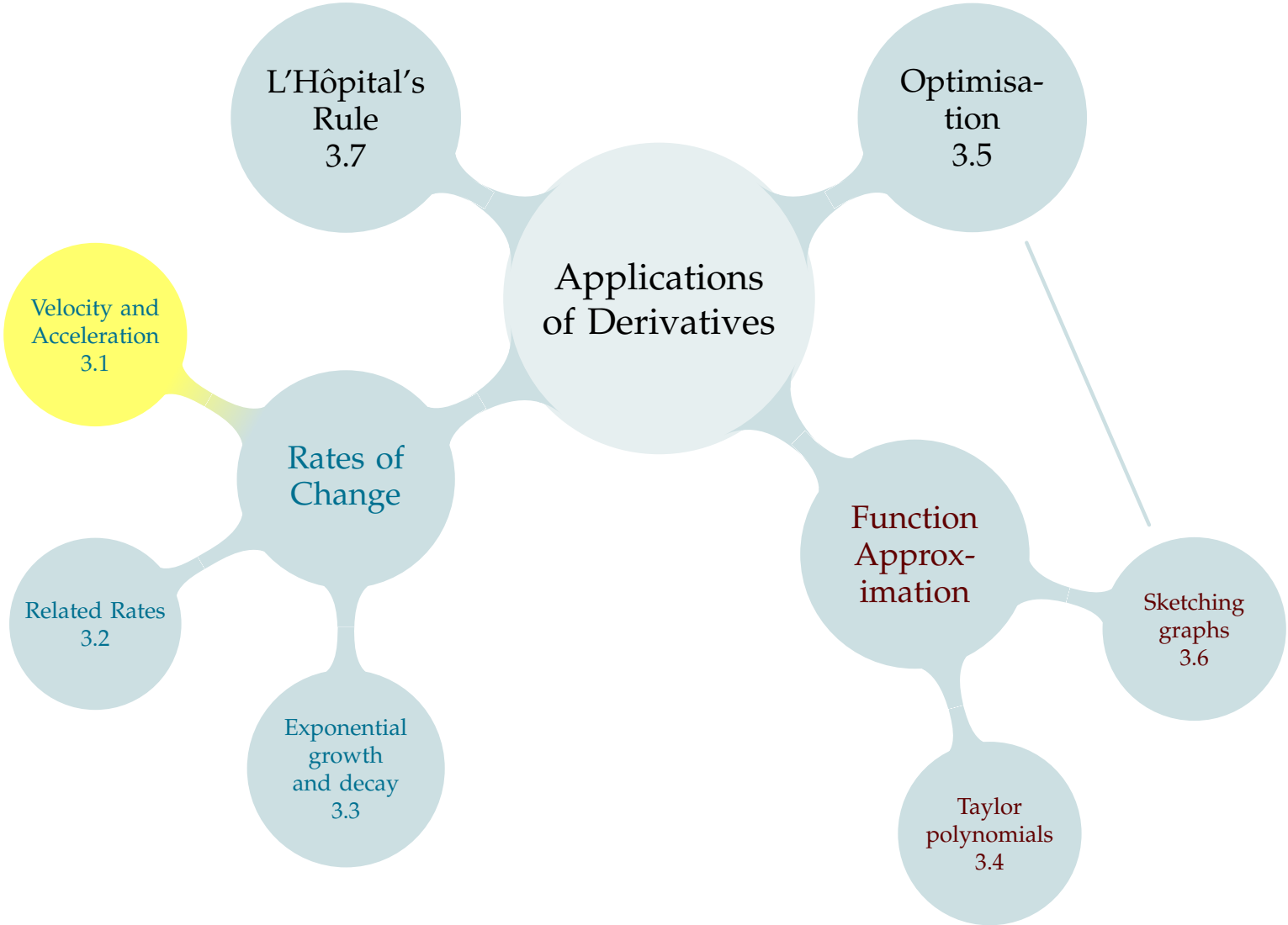
Table of Contents



The position of a unicyclist along a tightrope is given by

$$s(t) = t^3 - 3t^2 - 9t + 10$$

where $s(t)$ gives the distance in meters to the right of the middle of the tightrope, and t is measured in seconds, $-2 \leq t \leq 4$.

Describe the unicyclist's motion: when they are moving right or left; when they are moving fastest and slowest; and how far to the right or left of centre they travel.

A solution in a beaker is undergoing a chemical reaction, and its temperature (in degrees Celsius) at t seconds from noon is given by

$$T(t) = t^3 + 3t^2 + 4t - 273$$

1. When is the reaction increasing the temperature, and when is it decreasing the temperature?
2. What is the slowest rate of change of the temperature?

You roll a magnetic marble across the floor towards a metal fridge, giving it an initial velocity of 50 centimetres per second. The magnet imparts an acceleration on the magnet of 1 meter per second per second. If the magnet hits the fridge after 2 seconds, how far away was it when you rolled it?

The deceleration of a particular car while braking is 9 m/s^2.

1. Suppose the car needs to stop in 30m. How fast can it be going? (Give your answer in kph.)

2. Suppose the car needs to stop in 50m. How fast can it be going? (Give your answer in kph.)

Suppose your brakes decelerate your car at a constant rate. That is, d meters per second per second, for some constant d.

Is it true that if you double your speed, you double your stopping time?

Included Work