Taihu

The water level of Taihu Lake in Wuxi varies throughout the year due to rainfall and other factors. Suppose the water level $h(t)$ (in meters) of the lake as a function of time t (in days) is given by: $h(t)=2\sin(180\pi t)+5$ where t=0 represents January 1st.

1. Find the rate of change of the water level with respect to time on April 1st (i.e., when t=90 days).

2. Determine the days when the water level is at its highest and lowest points during the year.

3. On which days is the water level increasing?

Tianning Pagoda

The Tianning Pagoda in Changzhou is undergoing renovations. The construction company is using a crane to lift materials to various heights of the pagoda. The height $h(t)$ (in meters) of the crane's hook above the ground as a function of time t (in minutes) is given by: h(t)=3t^2−4t+10

1. Find the rate of change of the height of the crane's hook with respect to time at t=5 minutes.

2. Determine the time when the crane's hook is at its highest point during the first 10 minutes.

3. At what times is the height of the crane's hook decreasing?

West Lake

A company is planning to offer boat tours around West Lake in Hangzhou. The displacement $s(t)$ (in kilometers) the boat has traveled from its starting point as a function of time t (in hours) is given by: $s(t)=4t^3-6t^2+2t$

1. Find the boat's velocity at $t=2$ hours.
2. Determine the time(s) when the boat is stationary during the first 4 hours.
3. At what times is the boat moving in the opposite direction (i.e., retracing its path)?

Guillin

Due to various factors such as rainfall, dam releases, and evaporation, the water level $h(t)$ (in meters) of the Li River in Guilin as a function of time t (in days) throughout a year is modeled by: $h(t)=t^4-16t^3+72t^2-96t+30$

1. Find the days when the water level is stationary.
2. Determine which of these stationary points are points of inflection.
3. Identify the intervals where the water level is concave upwards and where it is concave downwards.
4. On which days does the river have non-stationary points of inflection?