(1) The concentration $C$ (in milligrams per milliliter) of a drug in a patient’s bloodstream $t$ hours after injection into muscle tissue is modeled by

$$C = \frac{3t}{2t^2 + t^3}.$$  

(i) Find the change in the concentration when $t$ changes from $t = 1$ to $t = 1.5$.  
(ii) Use differentials to approximate the change.

(2) Let $f(x) = \sqrt{|x - 2|}$. Discuss whether $f$ is continuous or differentiable at $x = 2$?

(3) When the tangent line exists at an inflection point, does it definitely cross the graph of the function? Why?

(4) Find the slope of the tangent at $(2, -2)$ of a curve $y^2 = \frac{x^3}{4 - x}$.

(5) The demand equation is given by $p = \sqrt[3]{9 - x^3}$ where $p$ is the unit price at which $x$ units of the product are demanded. Define the price elasticity of demand as $\eta = \frac{p/x}{dp/dx}$.

(i) Is the demand elastic ($|\eta| > 1$), inelastic ($|\eta| < 1$), or of unit elastic ($|\eta| = 1$) at $x = 1$? Give an economic interpretation for your answer.

(ii) Find the expression for the total revenue and compute the values of $x^*$ and $p^*$ that maximize the total revenue.

(iii) Show that the demand at $x^*$ is of unit elastic. Moreover, on the interval $(0, x^*)$ the demand is elastic and the total revenue is increasing.

(6) Let $f(x) = \frac{-3}{x^2 + 2}$.

(i) Find all critical numbers, relative extrema and points of inflection.

(ii) Determine (with reasons) whether $f$ has vertical or horizontal asymptotes.

(iii) Sketch the graph of $f$. 