Week-in-Review 10: 4.1-4.4
(Maxima, Minima, Mean value, Shapes of curves, L'Hospitals.)

Problem 1. Find the Absolute Maxima and the Absolute Minina for the given functions:

a) $f(x) = x^3 - 3x^2 - 1$ on the interval $[-1, 1]$.

b) $f(x) = \sqrt{6x - x^2}$ in its allowed Domain.

Problem 2. Use the Mean Value Theorem to find the number c that satisfies the theorem on the given interval.

a) $f(x) = 2x^2 - 3x + 1$ on the interval $[0, 2]$.

b) $f(x) = \ln x$ on the interval $[1, 4]$.

Problem 3. Find the critical numbers and then find the intervals where the following functions are increasing or decreasing. Identify each critical number as a maxima, minima or neither.

a) $f(x) = \dfrac{x+3}{5-x}$

b) $f(x) = x^2 e^{-2x}$

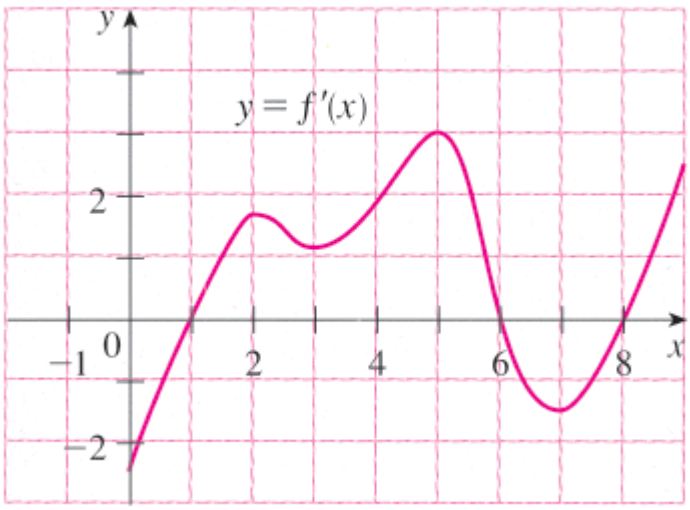
Problem 4. Identify the Inflection points and find the intervals where the following functions are concave up or concave down.

a) $f(x) = \ln(x^2 + 6x + 13)$

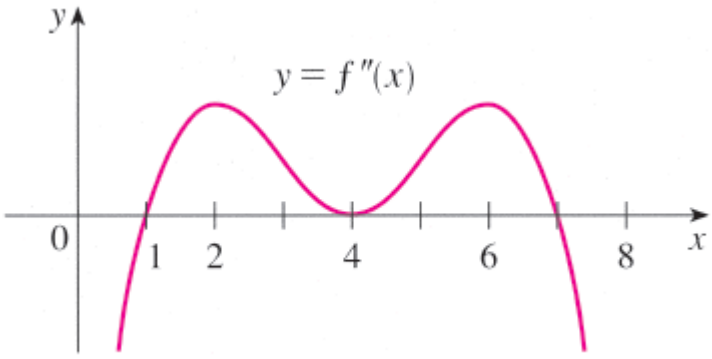
b) $f(x) = x^2 e^{-2x}$

Problem 5. Given the following graphs, identify all the local extrema and inflection points.

a) .



b) .



Problem 6. Find the following limits. You may use L'Hospital's rule, if applicable.

a) $\lim_{x\to\infty} \dfrac{\ln(5x)}{x^2}$

b) $\lim_{x\to(\pi/2)^-} (\sec x - \tan x)$

c) $\lim_{x \to 0} \dfrac{1 - \cos x}{2x^2}$

d) $\lim_{x \to \infty} (xe^{1/x} - x)$

e) $\lim_{x\to\infty}(1+e^{2x})^{1/x}$

f) $\lim_{x\to\infty}(1+\frac{3}{x}+\frac{5}{x^2})^{x}$