Worksheet 7

GRAPHING USING CALCULUS - PART I
FINDING RELATIVE MAXIMA USING CALCULUS - PART I

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Let the universe be $U = \mathbb{R} \times \mathbb{R}$ (the plane).

Exercise 7.1: Let $f : \mathbb{R} \longrightarrow \mathbb{R}$ be a well defined function such that $f(x) = x^4 - x^3$.
Find the critical value(s), all the relative maxima and minima, and find where f is increasing or where f is decreasing.

Exercise 7.2: Let $g : \mathbb{R} \longrightarrow \mathbb{R}$ be a well defined function such that $g(x) = x^4 + x^3$.
Find the critical value(s), all the relative maxima and minima, and find where g is increasing or where g is decreasing.

Exercise 7.3: Let $h : D \longrightarrow \mathbb{R}$ be a well defined function such that $h(x) = x^4 + x^3$ where $D = [0, \infty)$.
Find the critical value(s), all the relative maxima and minima, and find where h is increasing or where h is decreasing.

Exercise 7.4: Let $j : \mathbb{R} \longrightarrow \mathbb{R}$ be a well defined function such that $j(x) = \sqrt[3]{x}$.
Find the critical value(s), all the relative maxima and minima, and find where j is increasing or where j is decreasing.

Exercise 7.5: Let $k : \mathbb{R} \longrightarrow \mathbb{R}$ be a well defined function such that $k(x) = \sqrt[3]{x^2}$.
Find the critical value(s), all the relative maxima and minima, and find where k is increasing or where k is decreasing.

Exercise 7.6*: Let $p : \mathbb{R} \longrightarrow \mathbb{R}$ be a well defined function such that $p(x) = \frac{1}{4} \cdot x^4 - \frac{1}{3} \cdot x^3 - \frac{5}{2} \cdot x^2 - 3 \cdot x$.
Find the critical value(s), all the relative maxima and minima, and find where p is increasing or where p is decreasing.

Exercise 7.7*: Let $q : [-1, 1] \longrightarrow \mathbb{R}$ be a well defined function such that

$$q(x) = \frac{1}{4} \cdot x^4 - \frac{1}{3} \cdot x^3 - \frac{5}{2} \cdot x^2 - 3 \cdot x$$

Find the critical value(s), all the relative maxima and minima, and find where q is increasing or where q is decreasing.

Exercise 7.8*: Let $b : \mathbb{R} \longrightarrow \mathbb{R}$ be a well defined function such that

$$b(x) = \frac{1}{4} \cdot x^4 - \frac{2}{3} \cdot x^3 - \frac{5}{2} \cdot x^2 + 6 \cdot x$$

Find the critical value(s), all the relative maxima and minima, and find where b is increasing or where b is decreasing.

Note: * designates a challenging problem ('hard').