MATH 1500 Assignment 4

(Follows Unit 11 in the manual)

Values

[12] 1. Find the critical numbers of each of the following functions. [cf. Section 4.1]

(a) $f(x) = x^4 - 2x^2$ (b) $f(x) = xe^{2x}$ (c) $f(x) = 3x^{1/3} - x$

[12] 2. Find the absolute maximum and absolute minimum values of $f(x)$ on the given interval. [cf. Section 4.1]

(a) $f(x) = 6x^2 - x^3$ [–3, 5] (b) $f(x) = 3x^{1/3} - x$ [–2, 2]

[8] 3. Verify that the function $f(x) = x^3 + 3x$ satisfies the hypotheses of the Mean Value Theorem on the interval [0, 2].. Find all numbers *c* that satisfy the conclusion of the Mean Value Theorem. [cf. Section 4.2]

[12] 4. Determine the interval(s) where *f*(*x*) is increasing or decreasing. Find also the local maximum and local minimum values of $f(x)$.

(a) $f(x) = \dfrac{x}{(1+x)^2}$ (b) $f(x) = x^3 - 3x^2 + 5$

[10] 5. Determine where $f(x) = x^4 - 4x^3$ is concave up and where it is concave down. Find all the inflection points of $f(x) = x^4 - 4x^3$. [cf. Section 4.3]

[16] 6. If $f(x) = \dfrac{x^2 - 1}{x^2 - 4}$, then $f'(x) = \dfrac{-6x}{(x^2 - 4)^2}$ and $f''(x) = 6\left[\dfrac{3x^2 + 4}{(x^2 - 4)^3}\right]$.

(a) Determine the intervals where *f*(*x*) is increasing and where it is decreasing.
(b) Find all local maxima and all local minima.
(c) Determine where *f*(*x*) is concave up and where it is concave down.
(d) Find all inflection points.
(e) Find all horizontal asymptotes and all vertical asymptotes.
(f) Sketch the graph of *f*(*x*). [cf. Section 4.5]

Total = 70