

HOMEWORK NO. 6 – October 20, 2017

Exercise 1. Find the extreme values of the functions and where they occur.

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| (a) $y = 2x^2 - 8x + 9$ | (e) $\sqrt{x^2 - 1}$ | (h) $y = \sqrt{3 + 2x - x^2}$ |
| (b) $y = x^3 - 2x + 4$ | (f) $y = \frac{1}{\sqrt{1 - x^2}}$ | (i) $y = \frac{x}{x^2 + 1}$ |
| (c) $y = x^3 + x^2 - 8x + 5$ | | |
| (d) $y = x^3 - 3x^2 + 3x - 2$ | (g) $y = \frac{1}{\sqrt[3]{1 - x^2}}$ | (j) $y = \frac{x + 1}{x^2 + 2x + 2}$ |

Exercise 2.

- a. What are the critical points of f ?
- b. On what intervals is f increasing or decreasing?
- c. At what points, if any, does f assume local maximum and minimum values?

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| (1) $f'(x) = x(x - 1)$ | (5) $f'(x) = (x - 1)(x + 2)(x - 3)$ |
| (2) $f'(x) = (x - 1)(x + 2)$ | (6) $f'(x) = (x - 7)(x + 1)(x + 5)$ |
| (3) $f'(x) = (x - 1)^2(x + 2)$ | (7) $f'(x) = x^{-1/3}(x + 2)$ |
| (4) $f'(x) = (x - 1)^2(x + 2)^2$ | (8) $f'(x) = x^{-1/2}(x - 3)$ |

Exercise 3.

- a. Find the intervals on which the function is increasing and decreasing.
- b. Then identify the function's local extreme values, if any, saying where they are taken on.
- c. Which, if any, of the extreme values are absolute?

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| (1) $g(t) = -t^2 - 3t + 3$ | (8) $h(r) = (r + 7)^3$ | (15) $f(x) = \frac{x^2 - 3}{x - 2}, x \neq 2$ |
| (2) $g(t) = -3t^2 + 9t + 5$ | (9) $f(x) = x^4 - 8x^2 + 16$ | |
| (3) $h(x) = -x^3 + 2x^2$ | (10) $g(x) = x^4 - 4x^3 + 4x^2$ | (16) $f(x) = \frac{x^3}{3x^2 + 1}$ |
| (4) $h(x) = 2x^3 - 18x$ | (11) $H(t) = \frac{3}{2}t^4 - t^6$ | (17) $f(x) = x^{1/3}(x + 8)$ |
| (5) $f(t) = 3t^2 - 4t^3$ | (12) $K(t) = 15t^3 - t^5$ | (18) $f(x) = x^{2/3}(x + 5)$ |
| (6) $f(t) = 6t - t^3$ | (13) $g(x) = x\sqrt{8 - x^2}$ | (19) $f(x) = x^{1/3}(x^2 - 4)$ |
| (7) $f(r) = 3r^3 + 16r$ | (14) $g(x) = x^2\sqrt{5 - x}$ | (20) $f(x) = x^{2/3}(x^2 - 4)$ |

Exercise 4. Use the steps of the graphing procedure to sketch the general shape of the graph of f .

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| (1) $y = x^2 - 4x + 3$ | (15) $y = x^{1/5}$ |
| (2) $y = 6 - 2x - x^2$ | (16) $y = x^{2/5}$ |
| (3) $y = x^3 - 3x + 3$ | (17) $y = x^{3/5}$ |
| (4) $y = x(6 - 2x)^2$ | (18) $y = x^{4/5}$ |
| (5) $y = -2x^3 + 6x^2 - 3$ | (19) $y = 2x - 3x^{2/3}$ |
| (6) $y = 1 - 9x - 6x^2 - x^3$ | (20) $y = 5x^{2/5} - 2x$ |
| (7) $y = (x - 2)^3 + 1$ | (21) $y = x^{2/3} \left(\frac{5}{2} - x \right)$ |
| (8) $y = 1 - (x + 1)^3$ | (22) $y = x^{2/3}(x - 5)$ |
| (9) $y = x^4 - 2x^2 = x^2(x^2 - 2)$ | (23) $y = x\sqrt{8 - x^2}$ |
| (10) $y = -x^4 + 6x^2 - 4 = x^2(6 - x^2) - 4$ | (24) $y = (2 - x^2)^{3/2}$ |
| (11) $y = 4x^3 - x^4 = x^3(4 - x)$ | (25) $y = \frac{x^2 - 3}{x - 2}, x \neq 2$ |
| (12) $y = x^4 + 2x^3 = x^3(x + 2)$ | |
| (13) $y = x^5 - 5x^4 = x^4(x - 5)$ | |
| (14) $y = x \left(\frac{x}{2} - 5 \right)^4$ | (26) $y = \frac{x^3}{3x^2 + 1}$ |