Calculus 1510 Tutorial 6

1. Find $\dfrac{dy}{dx}$. Do not simplify.

(a) $y = (x^4 + 1)^{5x}$ (b) $y = x^{\cos 3x} + 7^{x^2},\ x > 0$

(c) $y = (\ln x)^{\ln x},\ x > 1$ (d) $y = \dfrac{\sqrt[3]{x - \tan x}(1 + 2x^3)^5}{\sqrt{1 + x^2}}$

2. Find whether the mean value theorem can be applied to the function on the interval. If it cannot, explain why. If it can, find all values of c in the interval satisfying $f'(c) = \frac{f(b)-f(a)}{b-a}$.

(a) $f(x) = 2x^2 - x - 2,\ \ -3 \le x \le 2$ (b) $f(x) = \sec x,\ \ 0 \le x \le \pi$

(c) $f(x) = \cos x,\ \ -\dfrac{\pi}{2} \le x \le \dfrac{5\pi}{2}$

3. Determine intervals on which the function is increasing or decreasing.

(a) $f(x) = 5 + 2x - 4x^2$ (b) $f(x) = x^3 - 3x^2 + 9x + 5$

4. Find all critical points of the function and determine algebraically with the first-derivative test which critical points give relative maxima or relative minima.

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