Review for Exam 3

MATH 1190 sec. 51

Sections Covered: 3.3 (Log. Diff), 4.5, 4.2, 4.3, 4.4, 4.8, 5.1, 5.2

This review is provided as a courtesy to give some idea of what material is covered. Nothing else is intended or implied.

(1) Find all critical numbers of the function.

(a) $f(x) = x^3 - 6x$

(b) $f(x) = \dfrac{x}{x^2+1}$

(c) $f(x) = x^2\sqrt{3-x}$

(d) $f(x) = (x-2)^3(x+4)^5$

(2) Find the absolute maximum and minimum values of the function and where they occur on the given interval.

(a) $f(x) = x^3 - 6x \quad [-1, 1]$

(b) $f(x) = \dfrac{x}{x^2+1} \quad [-2, 2]$

(3) Determine where the function is increasing, decreasing, concave up, concave down, and find the location (e.g. x-value) of all extrema and points of inflection.

(a) $y = x^2(2x^2 - 9)$

(b) $f(x) = \dfrac{x}{x^2+1}$

(4) Use logarithmic differentiation to find $\frac{dy}{dx}$.

(a) $y = (\ln x)^{\sin x}$

(b) $y = \dfrac{x \sin x}{\sqrt{x^2 + 3}}$

(c) $y = \sqrt{\dfrac{x+1}{x-1}}$

(5) Determine all antiderivatives of the function.

(a) $f(x) = x(x-1)$

(b) $h(x) = \cos x + \csc^2 x$

(c) $y = 4 \sin x - 3 \sec x \tan x$

(d) $f(x) = \dfrac{3x^3 + 2x^2 + 4}{x}$

(e) $h(x) = \dfrac{4}{\sqrt{1 - x^2}}$

(6) Evaluate each limit if it exists using any appropriate techniques.

(a) $\lim\limits_{x \to 0} \dfrac{\tan(2x)}{\ln(1+x)}$

(b) $\lim\limits_{x \to 1} \dfrac{\ln(x)}{e^{x-1}}$

(c) $\lim\limits_{x \to 0} \dfrac{\ln(1-x)}{e^x - 1}$

(d) $\lim\limits_{t \to 0} \dfrac{4^t - 6^t}{t}$

(e) $\lim\limits_{x \to \infty} \dfrac{x^3}{e^{2x}}$

(f) $\lim\limits_{x \to 0} \left(\dfrac{1}{x} - \dfrac{1}{e^x - 1} \right)$

(g) $\lim\limits_{x \to \infty} x^{1/\ln x}$

(7) Evaluate each integral by interpreting it in terms of areas.

(a) $\displaystyle\int_0^4 -\sqrt{16-x^2}\,dx$

(b) $\displaystyle\int_0^5 (|x-1|-1)\,dx$

(c) $\displaystyle\int_0^2 f(x)\,dx$ where $f(x) = \begin{cases} 1, & x \leq 1 \\ x, & x > 1 \end{cases}$