

CALCULUS 131: SAMPLE MIDTERM 2

Problem 1 (10 points). Please answer true or false. You do not need to justify your answer.

- (1) If $\lim_{x \rightarrow c} f(x) = L$ then $\lim_{x \rightarrow c} |f(x)| = |L|$.
- (2) $\lim_{h \rightarrow 0} f(x+h) = f(x)$ for any function f .
- (3) If $f(x) + g(x)$ is continuous at c then both $f(x)$ and $g(x)$ are continuous at c .
- (4) $|x|$ is differentiable at all points.
- (5) The function

$$f(x) = \begin{cases} x - 3 & \text{if } x \leq -1; \\ x^2 - 5 & \text{if } x > -1. \end{cases}$$

is continuous at all points.

Problem 2 (10 points).

- (1) State the ϵ - δ definition of $\lim_{x \rightarrow c} f(x) = L$. (3 points)
- (2) Using the definition, show that $\lim_{x \rightarrow -2} -2x + 1 = 5$. (7 points)

Problem 3 (15 points). Compute the following; please show your work.

(1)

$$\lim_{x \rightarrow \infty} \frac{x^7 - x^4 + 2x + 1}{3x^7 - \pi},$$

(2)

$$D_x((x^2 + 1)^{1/3}(x + 1)^2),$$

(3)

$$D_x((x + \sqrt{x})^7 + x^{-2/7}).$$

Problem 4 (8 points).

- (1) Define what it means for f to be continuous at c . (3 points)
- (2) Prove that if f and g are continuous at c , then $f + g$ is continuous at c . (5 points)

Problem 5 (7 points). Suppose that the distance d in feet covered by a car in t seconds is given by $d(t) = 5t^2 + 10t$ (not very realistic). At what time t is the car moving at 90 feet per second?