Math 131A Homework 5

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9/3/2020

19.1 Which of the following continuous functions are uniformly continuous on the specified set? Justify your answer.

    (a) $f(x) = x^{17}\sin x - e^x\cos 3x$ on $[0, \pi]$

    (c) $f(x) = x^3$ on $(0, 1)$

    (d) $f(x) = x^3$ on $\mathbb{R}$

    (e) $f(x) = \sin\frac{1}{x^2}$ on $(0, 1]$

19.2 Prove each of the following functions is uniformily continuous on the indicated set by directly verifying the ϵ-δ property in Definition 19.1.

    (a) $f(x) = 3x + 11$ on $\mathbb{R} \implies f(x) - f(y) = 3x + 11 - 3y - 11 = 3(x - y)$, then $|x - y| < \delta \implies |3(x - y)| < 3\delta$. Then if we take $\delta = \frac{\epsilon}{3}$ we have $|f(x) - f(y)| =< \epsilon$.

    (b) $f(x) = x^2$ on $[0, 3] \implies f(x) - f(y) = x^2 - y^2$, then for $x, y \in [0, 3]$, $|x - y| < \delta \implies x^2 - y^2 \leq |x - y|^2 < \delta^2$

19.4

19.7 (a)

20.14

20.16

28.2 (a)

    (b)

28.11

28.14

29.3 (a)

29.7

29.13

1

P1

P2

P3