

# Math 131A Homework 5

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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 uniformly continuous on the indicated set by directly verifying the  $\epsilon$ - $\delta$  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  $[0, 3]$

19.4

19.7 (a)

20.14

20.16

28.2 (a)

(b)

28.11

28.14

29.3 (a)

29.7

29.13

P1

P2

P3