

Worksheet week 3 - MAC 2311, Spring 2013

1. Compute each of the following limits. If the limit does not exist or is infinite, specify so.

(a) $\lim_{x \rightarrow 0} \frac{1 - \cos(3x)}{x^2}$

(b) $\lim_{x \rightarrow +\infty} \frac{1 - \cos(3x)}{x^2}$

(c) $\lim_{x \rightarrow 0} \frac{x \sin(5x)}{\tan^2(3x)}$

(d) $\lim_{x \rightarrow +\infty} \sin\left(\frac{\pi x}{2x + 1}\right)$

2. (a) Use the Intermediate Value Theorem (IVT) to approximate all real roots of the equation $x^3 - 4x^2 + 1 = 0$ to within intervals of length 1. Can you do the same but within intervals of length 0.5?

(b) From IVT it actually follows that any cubic equation has at least one real solution. Can you briefly explain why is this so?