# Math 341 Exam 2 Fall 2017  Name _____

1. Does $\lim_{x \to 0^+} \cos(1/x)$ exist? You must justify your answer.

2. Evaluate $\lim_{x \to \infty} \frac{5+3x}{\sqrt{3+2x}}$. You must justify your answer.

3. Let
$$f(x) = \begin{cases} x^{3/2} \sin \frac{1}{x^2} & \text{if } x \neq 0 \\ 0 & \text{if } x = 0 \end{cases}$$

Evaluate $f'(0)$. You must justify your answer.

4. State the Maximum-Minimum Theorem

5. State the Location of Roots Theorem

6. State the Uniform Continuity Theorem

7. State and **prove** the Boundedness Theorem.

8. State and **prove** the Product Rule for Derivatives.

9. Show that the function $1/x$ is uniformly continuous on $[1, \infty)$.

10. Use the Location of Roots Theorem to show that there is a number $c \in (0, \frac{\pi}{2})$ that is a root of the equation $x^2 - \cos x = 0$.