MATH1003

ASSIGNMENT 3

Suggested practice questions (the answers are in the back of the textbook):

- *§2.3; 21, 27, 33, 37, 43, 55, 61.*
- *§2.5; 21, 35, 41, 45.*

1. Calculate the following limits, if they exist:

(i) $\lim_{x\to 9} \dfrac{x^2-81}{\sqrt{x}-3}$,

(ii) $\lim_{x\to -1} \dfrac{|x|-1}{x+1}$.

2. Let $f(x)$ be the function given by:

$$f(x) = \begin{cases} x^2 - c^2, & \text{when } x < 4; \\ x(5+c), & \text{when } x \geq 4. \end{cases}$$

For what values of the constant c is the function continuous?

3. Does the limit $\lim_{x\to\infty} \cos x$ exist? If not, why not?

4. Let $f(x) = (2+x)^3(1-x)(3-x)$. Calculate:

$$\lim_{x\to-\infty} f(x) \qquad \text{and} \qquad \lim_{x\to\infty} f(x).$$

Sketch a graph of $y = f(x)$, making sure that you label the points of intersection with the axes.

5. By using the Squeeze Theorem, show that:

$$\lim_{x\to 0} \left(\sqrt{x^5 + 3x}\, \cos\frac{\pi}{x} \right) = 0.$$

6. Is there a constant a such that

$$\lim_{x\to -3} \frac{x^2 + ax + a + 3}{x^2 + 2x - 3}$$

exists? If so, find the value of a and the corresponding value of the limit.

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