4. A piece-wise function is defined by

$$f(x) = \begin{cases} x^2, & x < 3 \\ 2x + 3, & x \geq 3 \end{cases}$$

(i) Evaluate $\lim_{x \to 3^-} f(x)$

(ii) Evaluate $\lim_{x \to 3^+} f(x)$

(iii) Determine if $f(x)$ is continuous at $x = 3$ and justify your answer.

5. A Business Consultant charges \$3000 for the first hour of work and \$1000 for every hour or part thereof afterwards. The function for the amount the Consultant will cost you is given by:

$$f(x) = \begin{cases} \$3000, & 0 < x \leq 1 \\ \$4000, & 1 < x \leq 2 \\ \$5000, & 2 < x \leq 3 \end{cases}$$

(i) Find $\lim_{x \to 1} f(x)$ (ii) Find $\lim_{x \to 2.5} f(x)$

6. The monthly sales of KDW Pharmacy (in \$'000) is related to the amount that the pharmacy spends on advertising, $x$ (in million of dollars), and is given by the equation:

$$S(x) = \frac{70x^2 + 2}{10x + 2x^2}.$$

(i) Find $\lim_{x \to \infty} S(x)$

(ii) Discuss what this means to the management of the pharmacy.

7. The cost for a delivery service, in dollars, is based on the following cost function, $C(x)$, where the mass, $x$, of the parcel is measured in kilograms:

$$C(x) = \begin{cases} 100, & 0 < x \leq 6 \\ 20x, & 6 < x \leq 10 \\ 240, & 10 < x \leq 20 \end{cases}$$

a) Draw a graph of the function $C(x)$.

b) Evaluate the following where possible:

(i) $\lim_{x \to 5} C(x)$ (ii) $\lim_{x \to 6} C(x)$

(iii) $\lim_{x \to 10} C(x)$ (iv) $\lim_{x \to 14} C(x)$

Useful website for limits :: http://www.analyzemath.com/calculus/limits/find_limits_functions.html

*Revised by Ave McIntosh*
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