Cal I (S) (Maths 201–NYA)

NYA Cal I — Practice Quiz 4

1. Suppose $f(x) = \begin{cases} x^4 & \text{if } x < -1 \\ x & \text{if } -1 \le x < 1 \\ 1/x & \text{if } x \ge 1 \end{cases}$

   Find the values of x for which f is discontinuous. At which of these is f continuous from the right, from the left, or neither? Draw a rough sketch of the graph of f.

2. For what value(s) of the constant k is the function g continuous everywhere?

   $$g(x) = \begin{cases} kx^2 + 2x & \text{if } x < 2 \\ x^3 - kx & \text{if } x \ge 2 \end{cases}$$

3. If $f(x) = x^2 + 10 \sin x$, show that there is a number c so that $f(c) = 1000$.

4. A function f is a ratio of quadratic functions and has a vertical asymptote $x = 4$ and just one x-intercept, $x = 1$. Furthermore, f has a removable discontinuity at $x = -1$ and $\lim\limits_{x \to -1} f(x) = 2$.

   Evaluate $f(0)$, and $\lim\limits_{x \to \infty} f(x)$.

5. $f(x) = x^4 - x^6$. Find

   (a) the x and y intercepts;

   (b) $\lim\limits_{x \to -\infty} f(x)$;

   (c) $\lim\limits_{x \to \infty} f(x)$.

   Use this information to draw a rough sketch of the graph of $f(x)$.

Find the following limits:

1    $\displaystyle\lim_{x\to 9^-} \frac{x+1}{x-9} + \frac{x-2}{9-x}$

2    $\displaystyle\lim_{x\to -3} \frac{|x-2|-5}{x+3}$

3    $\displaystyle\lim_{x\to\infty} \sqrt{x+\sqrt{x}} - \sqrt{x-\sqrt{x}}$

4    $\displaystyle\lim_{x\to -\infty} \frac{e^x}{4+5e^{3x}}$ and $\displaystyle\lim_{x\to -\infty} \frac{e^{3x}}{4+5e^x}$

    $\displaystyle\lim_{x\to \infty} \frac{e^x}{4+5e^{3x}}$ and $\displaystyle\lim_{x\to \infty} \frac{e^{3x}}{4+5e^x}$

    $\displaystyle\lim_{x\to -\infty} \frac{e^x}{4+5e^x}$ and $\displaystyle\lim_{x\to \infty} \frac{e^x}{4+5e^x}$

5    $\displaystyle\lim_{x\to\infty} \frac{\sin(x)}{x}$

6    $\displaystyle\lim_{x\to 0} 5x^4 e^{\left(\cos\left(\frac{5}{x^5}\right)\right)}$

7    $\displaystyle\lim_{x\to 0} \sqrt[3]{x^2}\cos\left(\frac{3-x}{x^2}\right)$