Cursus : **Mathematics B2 (Newton)**

Date : January 13, 2017
Time : 13.45 - 15.45

Motivate all answers and calculations.
The use of electronic devices is not permitted.

[3p] **1.** a) Show by computation that for positive $a \in \mathbb{R}$

$$\lim_{x \to a} \frac{x - a}{\sqrt{x - a + 3} - \sqrt{3}} = 2\sqrt{3}$$

[2p] b) For which real value p is de function

$$f(x) = \begin{cases} px & \text{als} \quad x \leq a \\ \dfrac{x - a}{\sqrt{x - a + 3} - \sqrt{3}} & \text{als} \quad x > a \end{cases}$$

continuous in every x?

2. The function f is given by $f(x) = \sin(\cos(x))$.

[2p] a) Determine $f'(x)$.

[2p] b) Determine the linearisation of $f(x)$ in $x = \pi/4$.

[4p] **3.** Determine all extreme values (global and local) of the function $f(x) = xe^{-2x}$ on the interval $(0, 4]$.

4. Given

$$f(x, y) = \begin{cases} \dfrac{x^2 + y^2}{x^2 + y^4} & \text{als} \quad (x, y) \neq (0, 0) \\ 0 & \text{als} \quad (x, y) = (0, 0) \end{cases}$$

[2p] a) Is f continuous in $(0, 0)$?

[3p] b) Determine the equation for the tangent plane to the graph of $f(x, y)$ at the point $(2, 1, 1)$.

P.T.O.

[3p] **5.** a) Given is the function $f(x) = x^3 - 2/x$ for $1 \leq x \leq 3$. We divide the interval $[1, 3]$ in n equal sub-intervals. Give the expression for the Riemann sum of the function f in case we choose the right-most point of each sub-interval for evaluate f.

[3p] **6.** Determine $\dfrac{dy}{dx}$ in case

$$y(x) = \int_x^{x^2} \cos(t^3) \, dt$$

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[2p] **7.** a) Compute

$$\int x^2 \ln(2x) \, dx$$

[2p] b) Given is $\sinh(x) = (e^x - e^{-x})/2$. Compute

$$\int_{-1}^1 \sinh(t) \, dt$$

[3p] c) Compute

$$\int_0^\infty \frac{e^{-x}}{1 + e^{-2x}} \, dx$$

[2p] **8.** a) Compute

$$\sum_{k=1}^\infty 4\left(\frac{2}{3}\right)^k$$

[3p] b) Determine the McLaurin series for $1/(1 - 2x)^2$ by differentiating the geometric series $\sum_{n=0}^\infty (2x)^n$.

Total: 36 points