University of Balamand
Department of Mathematics

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Course: Calculus I
Semester: Fall 2020

Examination : First
Date:16 October
Duration: 60 minutes

Question 1. **[40%]**
Evaluate the following integrals:

a) $\int \sin^8(4x)\cos^3(4x)\ dx$ **b**) $\int (x^2+3x+2)\cos x\, dx$

c) $\int \dfrac{x}{x^2+2x-3}\, dx$ **d**) $\int \dfrac{\sqrt{4-e^{2x}}}{e^{3x}}\, dx$

Question 2. **[30%]**
Determine which of the following integrals converge or diverge:

a) $\displaystyle\int_0^1 \frac{\sqrt[3]{x^2+2x}}{\sqrt{x+x^3+x^2}}\, dx$ **b**) $\displaystyle\int_5^{+\infty} \frac{\sin^2(\sqrt{x})+4}{x^2\sqrt{x-2}}\, dx$ **c**) $\displaystyle\int_0^1 \frac{2}{x^2-5x+6}\, dx$

Question 3. **[20%]**
Evaluate the following integrals:

a) $\displaystyle\int_0^{+\infty} \frac{\sqrt{x}}{x+4}\, dx$ **b**) $\displaystyle\int_1^4 x^2\ln x\ dx$

Question 4. **[10%]**
Find the limit of the following function:

$$\lim_{x\to+\infty} \left(\frac{x^2+2x}{x^2}\right)^x$$