University of Ruhuna
Department of Mathematics

Bachelor of Science (General) Degree (Level II)

Industrial Mathematics

IMT 2b2β: Mathematical Computing

Assignment No: 08 **Semester I, 2012**

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1. Evaluate following indefinite integrals:

(i) $\int x^{-5}\,\mathrm{d}x$

(ii) $\int \frac{1}{x^3}\,\mathrm{d}x$

(iii) $\int \sin 3x\,\mathrm{d}x$

(iv) $\int \cos 3w\,\mathrm{d}w$

(v) $\int e^{x/4}\,\mathrm{d}x$

(vi) $\int \frac{1}{e^{3w}}\,\mathrm{d}w$

(vii) $\int \frac{1}{\sqrt{3x}}\,\mathrm{d}x$

(viii) $\int (2\sin 2x + 3(x+1)^2)\,\mathrm{d}x$

(ix) $\int x^2 \sin(x^3+1)\,\mathrm{d}x$

(x) $\int xe^x\,\mathrm{d}x$

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2. Evaluate following definite integrals:

(i) $\int_1^4 x^{100}\,\mathrm{d}x$

(ii) $\int_0^2 (5x^8 - 9x + 23)\,\mathrm{d}x$

(iii) $\int_0^1 \left(\frac{1}{2}x - \frac{2}{\sqrt{x}} - 1\right)\,\mathrm{d}x$

(iv) $\int_0^\pi e^x \cos x\,\mathrm{d}x$

(v) $\int_{-\infty}^{\infty} x^2 e^{-x^2/2}\,\mathrm{d}x$

(vi) $\int_0^{\pi/2} x\sin x\,\mathrm{d}x$

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3. Evaluate following double integrals:

(i) $\int_0^1\int_1^2 (4x^3 - 9x^2y^2)\,\mathrm{d}y\mathrm{d}x$

(ii) $\int_{\pi/6}^{\pi/2}\int_{-1}^{5} \cos y\,\mathrm{d}x\mathrm{d}y$

(iii) $\int_0^1\int_0^1 xy\sqrt{x^2+y^2}\,\mathrm{d}y\mathrm{d}x$

(iv) $\int_0^2\int_0^\pi r\sin^2\theta\,\mathrm{d}\theta\mathrm{d}r$

(v) $\int_0^1\int_1^2 \frac{xe^x}{y}\,\mathrm{d}y\mathrm{d}x$

(vi) $\int_0^1\int_0^3 e^{x+3y}\,\mathrm{d}x\mathrm{d}y$

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4. Evaluate $\int\int_D (x+2y)\,\mathrm{d}A$, where D is the region bounded by the parabolas $y = 2x^2$ and $y = 1 + x^2$.

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5. Find partial fractions of following expressions:

(i) $\dfrac{x+35}{x^2-25}$

(ii) $\dfrac{4x-3}{x^2-5x+6}$

(iii) $\dfrac{x-2}{(x+1)(x-1)^2}$

(iv) $\dfrac{x^2-9x+9}{(x^2+1)(x-2)}$

(v) $\dfrac{x-1}{(x+3)(x^2+3x+2)}$

(vi) $\dfrac{6s^2+3s+2}{2s^2+14s+20}$

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6. Compute the following limits:

(i) $\lim_{n\to\infty} \dfrac{n+1}{n-1}$

(ii) $\lim_{n\to\infty} \left(1+\dfrac{1}{n}\right)^n$

(iii) $\lim_{x\to 0} \dfrac{\sin\left(\dfrac{1}{x}\right)}{x}$

(iv) $\lim_{x\to 0} \sin\left(\dfrac{1}{x}\right)$

(v) $\lim_{x\to 0} x\sin\left(\dfrac{1}{x}\right)$

(vi) $\lim_{x\to 0} exp\left(\dfrac{1}{x}\right)$

(vii) $\lim_{x\to 0^+} \exp\left(\dfrac{1}{x}\right)$

(viii) $\lim_{x\to 0^-} \exp\left(\dfrac{1}{x}\right)$

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