CONCORDIA UNIVERSITY

Math-205, Midterm Test

22 July, 2009

Instructions: The marks of each question is indicated, with the $100\% = 15\,\text{pts}$.
This is a closed-book test, notes are not allowed.

1. (2pt): Find the antiderivative $F(x)$ of the function $f(x) = x\,e^{-x^2}$ such that $F(0) = 3$.

2. (2pt): Find the derivative $\mathrm{d}F/\mathrm{d}x$ of the function

$$F(x) = \int_{x^2-1}^{0} \frac{\sin(t+1)}{t+1}\,\mathrm{d}t$$

3. (6pt): Calculate the following indefinite integrals

$$(\mathbf{a}) \quad \int \frac{(\sqrt{2x}-1)^2}{x}\,\mathrm{d}x \qquad (\mathbf{b}) \quad \int 2t\,\ln(1+t)\,\mathrm{d}t \qquad (\mathbf{c}) \quad \int \frac{2x+1}{x^2-7x+12}\,\mathrm{d}t$$

4. (4pt): Evaluate the following definite integrals (*do not approximate*):

$$(\mathbf{a}) \quad \int_0^2 \frac{1+\arctan(x/2)}{4+x^2}\,\mathrm{d}x \qquad (\mathbf{b}) \quad \int_0^1 x^2\,e^x \mathrm{d}x$$

5. (2pt): Find the mean value of the function $f(x) = \sin(2x)\cos^2(x)$ on the interval $[0, \pi/2]$.

Bonus. (1pt): Find the following sum

$$\sum_{k=3}^{21} (2k-4)^2$$

(Reminder: $\sum_{k=1}^{n} k^2 = n\,(n+1)\,(2n+1)/6\,$)