Math 1000 – Dalhousie University – Summer 2010

Assignment 10 – Due Monday August 16

IF YOU PASS THIS IN BEFORE NOON ON MONDAY, IT WILL BE MARKED AND RETURNED TO YOU ON MONDAY EVENING

You can submit your assignment early by leaving it on my office door or by emailing me a scanned copy / digital photo / typed version of your assignment.

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1. Verify by differentiation that the equation is correct: $\int x\cos x\,dx = x\sin x + \cos x + C$.

2. Find the following indefinite integrals.

   (a) $\int (1 + 2x - 4x^3)\,dx$

   (b) $\int \sqrt{2t}\,dt$

   (c) $\int \dfrac{3x-2}{\sqrt{x}}\,dx$

   (d) $\int (\tan^2\theta + 1)\,d\theta$

   Hint for (d): write $\tan\theta$ as $\frac{\sin\theta}{\cos\theta}$ and get a common denominator; then use a trig identity.

3. The velocity function (in m/s) for a particle moving along a line is $v(t) = 2t - 3$.

   (a) Find the displacement of the object during the time period $0 \le t \le 4$.

   (b) Find the distance travelled by the particle during that time period.

4. Evaluate the following integrals by making the suggested subsitution.

   (a) $\int e^{3x}\,dx$, letting $u = 3x$.

   (b) $\int \dfrac{\sec^2(1/x)}{x^2}dx$, letting $u = \frac{1}{x}$.

5. Evaluate the following definite and indefinite integrals using the subsitution rule.

   (a) $\int x^2(x^3+5)^9\,dx$

   (b) $\int \dfrac{\sin\sqrt{x}}{\sqrt{x}}\,dx$

   (c) $\int \sec^4\theta\tan\theta\,d\theta$ (Hint: write $sec^4\theta$ as $\sec^3\theta\sec\theta = (\sec\theta)^3\sec\theta$.)

   (d) $\int_e^{e^9} \dfrac{1}{x\sqrt{\ln x}}\,dx$

   (e) $\int_0^{\pi/2} \cos x\sin(\sin x)\,dx$ (Note: We don't know exact value of $\cos 1$; leave as $\cos 1$.)

BONUS QUESTION (1): Evaluate $\int \frac{x}{1+x^4}\,dx$. (Hint: $\arctan x$)

BONUS QUESTION (2): Evaluate $\int_{-\pi/2}^{\pi/2} \frac{x^2 \sin x}{1+x^6}\,dx$.