Homework 23

The **due date** for this homework is **Tue 7 May 2013 12:00 AM EDT**.

Question 1

$$\int \frac{x^2}{\sqrt{4-x^2}}\,dx =$$

- $x - \frac{1}{4}x\sqrt{4-x^2} + C$
- $\frac{x}{2} - \frac{1}{4}\cos 2x + C$
- $-2\arccos\frac{x}{2} - \frac{1}{2}x\sqrt{4-x^2} + C$
- $-\frac{1}{2}\arccos\frac{x}{2} - \frac{1}{8}x\sqrt{4-x^2} + C$
- $\frac{1}{2}\arcsin\frac{x}{2} - \frac{1}{8}x\sqrt{4-x^2} + C$
- $2\arcsin\frac{x}{2} - \frac{1}{2}x\sqrt{4-x^2} + C$

Question 2

In Lecture we saw that we can use the substitution $x = \frac{b}{a}\sin\theta$ to (hopefully) calculate integrals involving $\sqrt{b^2 - a^2x^2}$. Another equally suitable subsitution in this case is $x = \frac{b}{a}\cos\theta$. Use the latter to compute

$$\int \frac{\sqrt{1-x^2}}{x^2}\,dx =$$

- $\dfrac{\sqrt{1-x^2}}{x^2} + \arccos x + C$
- $-\dfrac{\sqrt{1-x^2}}{2x^2} - \dfrac{1}{2}\arccos x + C$
- $x\sqrt{1-x^2} - \arccos x + C$
- $-\dfrac{\sqrt{1-x^2}}{x} + \arccos x + C$
- $\dfrac{\sqrt{1-x^2}}{x^2} + 2\arccos x + C$
- $-\dfrac{\sqrt{1-x^2}}{x} - 2\arccos x + C$

Question 3

$$\int (1-x^2)^{-3/2}\,dx =$$

- $\dfrac{x}{\sqrt{1-x^2}} + C$
- $\dfrac{1}{\sqrt{1-x^2}} + C$
- $\dfrac{1}{2}\arcsin x + \sqrt{1-x^2} + C$
- $\arcsin x + \dfrac{x}{\sqrt{1-x^2}} + C$
- $-2\sqrt{1-x^2} + C$
- $\arccos x + \dfrac{1}{\sqrt{1-x^2}} + C$

Question 4

$$\int \frac{dx}{\sqrt{x^2-6x+10}} =$$

- $\ln\left|x - 3 + \sqrt{x^2 - 6x + 10}\right| + C$
- $\operatorname{arcsinh}\sqrt{x^2 - 6x + 10} + C$
- $\dfrac{\sqrt{x^2 - 6x + 10}}{2x} + C$
- $\operatorname{arcsinh}(x - 3) + C$
- $\dfrac{1}{2}\operatorname{arccosh}(x - 3) - \dfrac{\sqrt{x^2 - 6x + 10}}{4x} + C$
- $\dfrac{1}{2}\operatorname{arcsinh}(x - 3) + \dfrac{1}{4}\, x\sqrt{x^2 - 6x + 10} + C$

Question 5

$$\int \frac{x}{\sqrt{1 + x^2}}\ dx =$$

- $\ln\left|x + \sqrt{1 + x^2}\right| + C$
- $\dfrac{1}{2}\left(\operatorname{arcsinh} x - x\sqrt{1 + x^2}\right) + C$
- $\dfrac{x}{1 + x^2} + C$
- $\sqrt{1 + x^2} + C$
- $\dfrac{1}{\sqrt{1 + x^2}} + C$
- $\ln|x + 1| + \dfrac{1}{\sqrt{1 + x^2}} + C$

Question 6

In Homework 21, we use the substitutions $u = \dfrac{1}{x}$ (Problem 7) and $u = \sqrt{x^2 - 1}$ (Problem 8) to compute the integral

$$I(x) = \int \frac{dx}{x\sqrt{x^2-1}}$$

Another possible substitution is $x = \sec\theta$. Using it, compute $I(x)$.

- $\frac{1}{2}\sqrt{x^2-1} - \operatorname{arcsec} x + C$
- $x \arccos\sqrt{x^2-1} + C$
- $\arccos\frac{1}{x} + C$
- $\sqrt{x^2-1}\arccos x + C$
- $\frac{\sqrt{x^2-1}}{2x^2} + C$
- $\operatorname{arcsec}\frac{1}{x} + C$

Question 7

$$\int \frac{1}{\sqrt{x^2-2x-8}}\,dx =$$

- $\frac{1}{3}\ln\left|x-1+\sqrt{x^2-2x-8}\right| + C$
- $\frac{1}{2}\sqrt{x^2-2x-8} + \operatorname{arccosh}\frac{x-1}{3} + C$
- $\frac{1}{3}\sqrt{x^2-2x-8} - \operatorname{arccosh}\frac{x-1}{3} + C$
- $\ln\left|x-1+\sqrt{x^2-2x-8}\right| + C$
- $\operatorname{arccosh}\frac{x-1}{3} + C$
- $-\sqrt{x^2-2x-8} + C$

☐ In accordance with the Honor Code, I certify that my answers here are my own work.

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