# Section 7.1, Techniques of Integration

Homework: 7.1 #1–53 odds

This section is a review of integration formulas that we have looked at so far this semester, as well as the ones that you learned in Calculus I. There is a table with formulas on pages 383 and 384 that may be helpful summary.

**Examples**
Perform each of the following integrations:

1. $\displaystyle\int \frac{3x}{\sin^2(4x^2)}\,dx$

$$\int \frac{3x}{\sin^2(4x^2)}\,dx = \int 3x\csc^2(4x^2)\,dx \quad (\text{Let } u = 4x^2)$$
$$= -\frac{3}{8}\cot(4x^2) + C$$

2. $\displaystyle\int \frac{5e^{3/x^2}}{x^3}\,dx$

$$\int \frac{5e^{3/x^2}}{x^3}\,dx = \int 5e^{3x^{-2}}x^{-3}\,dx \quad (\text{Let } u = 3x^{-2})$$
$$= -\frac{5}{6}e^{3x^{-2}} + C$$

3. $\displaystyle\int \frac{5}{9+(2x-1)^2}\,dx$
Let $u = (2x-1)^2$. Then,

$$\int \frac{5}{9+(2x-1)^2}\,dx = \frac{5}{6}\tan^{-1}\left(\frac{2x-1}{3}\right) + C$$

4. $\displaystyle\int \frac{3x^2-4x+2}{x-2}\,dx$
After doing long division, we see that $\frac{3x^2-4x+2}{x-2} = 3x + 2 + \frac{6}{x-2}$, so

$$\int \frac{3x^2-4x+2}{x-2}\,dx = \int \left(3x+2+\frac{6}{x-2}\right)dx$$
$$= \frac{3}{2}x^2 + 2x + 6\ln\left|x-2\right| + C$$

5. $\displaystyle\int \frac{2x}{\sqrt{1-x^4}}\,dx$
Let $u = x^2$. Then,

$$\int \frac{2x}{\sqrt{1-x^4}}\,dx = \sin^{-1}(x^2) + C$$

6. $\displaystyle\int \frac{\sin(\ln 4x^2)}{x}\,dx$

Let $u = \ln 4x^2$. Then,

$$\int \frac{\sin(\ln 4x^2)}{x}\,dx = -\frac{1}{2}\cos(\ln 4x^2) + C$$