# MATH 231 U1, Spring 2009
# Answers to HW 1, Section 6.1 problems 8, 10, 24, 36
# Friday January 23rd, 2009

6.1

#8:

$$\int \frac{2}{x^{1/4}+x}\,dx = \int \frac{2}{x^{1/4}(1+x^{3/4})}\,dx$$

This question was easier if you did #7 from the suggested problems first. Using the $u$-substitution $u = 1 + x^{3/4}$, $du = \frac{3}{4}x^{-1/4}\,dx$, we have

$$\begin{aligned}\int \frac{2}{x^{1/4}(1+x^{3/4})}\,dx &= \frac{8}{3}\int \frac{du}{u}\\ &= \frac{8}{3}\ln|u| + C\\ &= \frac{8}{3}\ln|1+x^{3/4}| + C.\end{aligned}$$

#10:

$$\int \frac{\cos(1/x)}{x^2}\,dx$$

Using the $u$-substitution $u = \frac{1}{x}$, $du = \frac{-1}{x^2}\,dx$, we have

$$\begin{aligned}\int \frac{\cos(1/x)}{x^2}\,dx &= -\int \cos u\\ &= -\sin u + C\\ &= -\sin(1/x) + C.\end{aligned}$$

#24:

$$\int \frac{4x+4}{5+2x+x^2}\,dx$$

Using the $u$-substitution $u = 5 + 2x + x^2$, $du = (2 + 2x)\,dx$, we have

$$\begin{aligned}\int \frac{4x+4}{5+2x+x^2}\,dx &= \int \frac{2du}{u}\\ &= 2\ln|u| + C\\ &= 2\ln|5+2x+x^2| + C.\end{aligned}$$

#36:

$$\int_0^1 x(x-3)^2\,dx$$

This can be done using the $u$-substitution $u = x - 3$, but you can also just expand the integrand.

$$\begin{aligned}\int_0^1 x(x-3)^2\,dx &= \int_0^1 x^3 - 6x^2 + 9x\,dx \\ &= (\frac{x^4}{4} - 2x^3 + \frac{9}{2}x^2)|_0^1 \\ &= \frac{11}{4}\end{aligned}$$