

## Self Study exercises Math B2, week 6

1. Evaluate the following indefinite integrals

(a)  $\int \frac{4x^3}{(x^4+1)^2} dx$  (substitute  $u = x^4 + 1$ )

(b)  $\int \frac{1}{5s+4} ds$  (substitute  $u = \dots$ )

2. See Thomas, page 344, for the substitution formula in definite integrals (the limits of integration change by substitution!). Use this formula in evaluating the following definite integrals:

(a)  $\int_0^1 r\sqrt{1-r^2} dr$  (substitute  $u = 1 - r^2$ )

(b)  $\int_0^{\frac{\pi}{3}} \frac{4\sin\theta}{1-4\cos\theta} d\theta$  (substitute  $u = \dots$ )

3. See Thomas, page 346. Theorem 8 deals with the definite integral of symmetric functions.

(a) Show that if  $f$  is odd on  $[-\pi, \pi]$ , then  $\int_{-\pi}^{\pi} f(x) dx = 0$ .

(b) Find  $\int_{-\pi}^{\pi} \sin x \cos x dx$  and  $\int_{-\pi}^{\pi} \sin^2 x dx$ .

4. Use the formula  $\int u dv = uv - \int v du$  (integration by parts) in evaluating the following integrals:

(a)  $\int x \ln(x) dx$  (take  $u = \ln(x)$  and  $v = \frac{1}{2}x^2$ .)

(b)  $\int xe^{4x} dx$

(c)  $\int x^2e^{4x} dx$

5. See Thomas, page 458, integration by parts for definite integrals.

Find  $\int_0^{\pi} t \sin(t) dt$ .

6. Evaluate  $\int_0^4 \frac{dx}{\sqrt{4-x}}$

(improper integral, use limit for evaluation, see Thomas page 504.)