Mr. Kouichek
HmwK 6.5

Evaluating Definite Integrals

6.5 Pg 463 (1, 2, 9, 10, 15, 29)

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

let $u = (x^2-1)$ Then $du = 2x\,dx$

so $x\,dx = \frac{1}{2}du$

if $x = 0$ Then $u = -1$

if $x = 2$ Then $u = 2^2 - 1 = 3$

so substituting gives $\frac{1}{2}\int_{-1}^{3} u^3 du = \frac{1}{2}\left(\frac{1}{4}\right)u^4\Big|_{-1}^{3}$

$= \frac{1}{8}u^4\Big|_{-1}^{3} = \frac{1}{8}(81) - \frac{1}{8}(1)$

$= \frac{80}{8} = 10$ sq. units

2. $\int_0^1 x^2(2x^3-1)^4 dx$

let $u = (2x^3-1)$ Then $du = 6x^2 dx$

so $\frac{1}{6}du = x^2 dx$

if $x = 0$ Then $u = -1$ but if $x = 1$ Then $u = 1$

substituting gives

$\frac{1}{6}\int_{-1}^{1} u^4 du = \frac{1}{6}\left(\frac{1}{5}\right)u^5\Big|_{-1}^{1} = \frac{1}{30}(+1) - \frac{1}{30}(-1)$

$= \frac{1}{30} + \frac{1}{30} = \frac{2}{30} = \frac{1}{15}$ sq. units

6.5 Pg 463 (Cont. 9, 10, 15, 29)

9. $\int_1^3 (2x-1)^4 dx$

let $u=(2x-1)$ Then $du = 2dx$
so $\frac{1}{2}du = dx$

if $x=1$ Then $u = 2(1)-1 = 1$ and if $x=3$ Then $u=5$
so substituting above gives

$$\frac{1}{2}\int_1^5 u^4 du = \frac{1}{2}\left(\frac{1}{5}\right)u^5\Big|_1^5 = \frac{1}{10}(3125) - \frac{1}{10}(1) = \frac{3124}{10}$$

$$= 312.4 \text{ sq. units}$$

10. $\int_1^2 (2x+4)(x^2+4x-8)^3 dx$

let $u = (x^2+4x-8)$ Then $du = (2x+4)dx$

if $x=1$ Then $u = -3$ and if $x=2$ Then $u=4$
substituting from above gives

$$\int_{-3}^4 u^3 du = \left(\frac{1}{4}\right)u^4\Big|_{-3}^4 = \left(\frac{1}{\cancel{4}}\right)(64\cdot\cancel{4}) - \frac{1}{4}(81)$$

$$= 64 - \frac{81}{4} = 64 - 20\tfrac{1}{4}$$

$$= 43\tfrac{3}{4} \text{ sq. units}$$

Mr. Konichek
Hmwk 6.5 cont.
Page 3 (last page)

6.5 Pg 463 (15, 29) cont.

15. $\int_0^2 2x e^{x^2} dx$

~~Let $u = e^{x^2}$ Then $du = (2x)(e^{x^2})dx$~~ Too much

Try again
let $u = x^2$ Then $du = 2x\,dx$
if $x = 0$ Then $u = 0$ and if $x = 2$ Then $u = 4$
substituting above info. gives

$$\int_0^4 e^u du = (1)e^u \Big|_0^4 = e^4 - e^0 = e^4 - 1 \text{ sq. units}$$

29. Find The area of the region under the graph of f on [a, b]; $f(x) = x^2 - 2x + 2$; $[-1, 2]$

$$\int_{-1}^{2} (x^2 - 2x + 2)\, dx$$

$$= \frac{1}{3}x^3 - 2\left(\frac{1}{2}\right)x^2 + 2x \Big|_{-1}^{2}$$

$$= \left(\frac{1}{3}(8) - 2^2 + 2(2)\right) - \left(\frac{1}{3}(-1)^3 - (-1)^2 + 2(-1)\right)$$

$$= \left(\frac{8}{3} - 4 + 4\right) - \left(-\frac{1}{3} - 1 - 2\right)$$

$$= \frac{8}{3} - \left(-\frac{10}{3}\right) = \frac{8}{3} + \frac{10}{3} = \frac{18}{3} = 6 \text{ sq. units}$$