1. $\sum_{i=1}^{7} i(i+3)^2 =$

$\sum_{i=1}^{7} i(i^2+6i+9)$

5.2, P.303 #23

(a) 1876
(b) 1678
(c) 1786
(d) 1668
(e) 1787

$= \sum_{i=1}^{7} i^3+6i^2+9i$

$= \sum_{i=1}^{7} i^3 + 6\sum_{i=1}^{7} i^2 + 9\sum_{i=1}^{7} i$

$= \frac{7^2(7+1)^2}{4} + 6\frac{(7(7+1)(14+1))}{6} + 9\left(\frac{7\cdot 8}{2}\right)$

$= 784 + 840 + 252 = 1876$

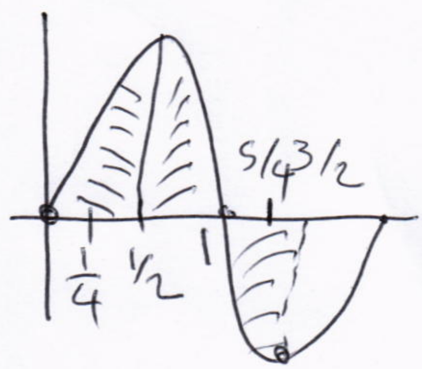
2. Use the midpoint rule with $n = 3$ to approximate, the area of the region bounded by the graph of $f(x) = \sin \pi x$ and the x-axis over $\left[0, \frac{3}{2}\right]$

#33, 34, 5.2

(a) $\frac{\sqrt{2}}{4}$
(b) $\frac{3}{4}\sqrt{2}$
(c) $\frac{\sqrt{2}}{2}$
(d) $\frac{3\sqrt{2}}{2}$
(e) 0

$[0, \frac{1}{2}], [\frac{1}{2}, 1], [1, 3/2]$

$\sum_{i=1}^{3} f(x_i)\Delta x$



$x_1 = 1/4,\ x_2 = 3/4,$
$x_3 = 5/4$

$\frac{1}{2}\left[\sin\frac{\pi}{4} + \sin\frac{3\pi}{4} + \sin\frac{5\pi}{4}\right]$

$= \frac{1}{2}\left[\frac{\sqrt{2}}{2} + \frac{\sqrt{2}}{2} - \frac{\sqrt{2}}{2}\right] = \frac{\sqrt{2}}{4}$

3. When evaluating the limit of $\sum_{i=1}^{n}\left(1+\frac{3}{c_i}\right)\triangle x$, as $\parallel \triangle x \parallel \to 0$ over $[1,5]$, where c_i is any point in the i^{th} subinterval, the value is equal to:

5.3, #13

(a) $4+\ln(125)$

(b) $4\ln(5)$

(c) $\frac{-12}{5}$

(d) $\frac{8}{5}$

(e) $\frac{3}{5}$

$$\int_1^5 \left(1+\frac{3}{x}\right)dx$$

$$= \Big[x+3\ln|x|\Big]_1^5 =$$

$$(5+3\ln 5)-(1+3\ln(1)) = 4+3\ln 5$$

$$= 4+\ln(125)$$

4. $\lim_{n\to\infty}\frac{\sqrt{1}+\sqrt{2}+\sqrt{3}+\ldots\sqrt{n}}{n^{3/2}}$ equals to

#85/P. 316

(a) $\frac{2}{3}$

(b) $\frac{3}{2}$

(c) $\sqrt{3}$

(d) 0

(e) ∞

$$\frac{1}{n}\left(\sqrt{\frac{1}{n}}+\sqrt{\frac{2}{n}}+\ldots\sqrt{\frac{n}{n}}\right)$$

$$= \frac{\sqrt{1}+\sqrt{2}+\sqrt{3}+\ldots+\sqrt{n}}{n\sqrt{n}}$$

$$\Delta x = 1/n$$

$$\frac{1-0}{n} = \int_0^1 \sqrt{x}\,dx = \Big[\tfrac{2}{3}x^{3/2}\Big]_0^1$$

$$= 2/3$$

5. Given that $\int_2^6 x^3 dx = A$ and $\int_2^6 x\,dx = B$, the integral of $\int_2^6 \left(6|x| - \frac{1}{8}x^3\right) dx =$

(a) $6B - \frac{1}{8}A$

(b) $-6B - \frac{1}{8}A$

(c) $12B - \frac{1}{8}A$

(d) $2B - \frac{1}{8}A$

(e) $-12B + \frac{1}{8}A$

$$6\int_2^6 |x|dx - \frac{1}{8}\int_2^6 x^3 dx$$

over $[2,6]$, $|x| = x$

$$6\int_2^6 x\,dx - \frac{1}{8}\int_2^6 x^3 dx$$

$$= 6B - \frac{1}{8}A$$

#42/P. 314

6. The constant c, that is guaranteed by the mean value theorem of Integral of $f(x) = 5 - \frac{1}{x}$ over $[1,4]$ is equal to

#47/P. 328

(a) $\frac{3}{\ln 4}$

(b) $\frac{1}{\ln 4 - 10}$

(c) $\frac{1}{2\ln 2}$

(d) $\frac{1}{2\ln 2 + 10}$

(e) $\frac{1}{\ln 2}$

$$\int_1^4 \left(5 - \frac{1}{x}\right) dx = \Big[5x - \ln x\Big]_1^4$$

$$= (20 - \ln 4) - (5 - 0) =$$

$$15 - \ln 4 = f(c)(4-1)$$

$$\frac{15 - \ln 4}{3} = 5 - 1/c$$

$$c = \frac{3}{\ln 4}$$

7. If $F(x) = \int_0^{2x} \cos t^4 \, dt$, then $F'(x) =$

#86 / P#330

(a) $2\cos(16x^4)$

(b) $-2\cos(16x^4)$

(c) $32\cos(x^4)$

(d) $\cos(16x^4)$

(e) $-\cos(16x^4)$

$F'(x) = 2\cos(2x)^{4}$

$= 2\cos(16x^4)$

FTC.

$-\sqrt{2}\int_1^9 \frac{1}{\sqrt{x}(1+\sqrt{x})^2}\,dx$

8. $\int_9^1 \frac{\sqrt{2}}{\sqrt{x}(1+\sqrt{x})^2}\,dx =$

$u = 1+\sqrt{x} \Rightarrow du = \frac{dx}{2\sqrt{x}}$

$x=1 \Rightarrow u=2, \; x=9 \Rightarrow u=4$

$\int_2^4 \frac{1}{u^2} 2\,du = 2\int_2^4 u^{-2}\,du$

(a) $\frac{-\sqrt{2}}{2}$

(b) $\frac{-1}{2}$

(c) $\frac{\sqrt{2}}{2}$

(d) $\frac{1}{2}$

(e) $8\sqrt{2}$

$= \frac{-2}{u}$

$-2\left[\frac{1}{u}\right]_2^4 = -2\left[\frac{1}{4}-\frac{1}{2}\right] = 1/2$

$-\sqrt{2}\left(\frac{1}{2}\right) = \boxed{\frac{-\sqrt{2}}{2}}$

9. $\int x\sqrt{x+6}\,dx =$

#65, P650

$u = x+6 \Rightarrow u-6 = x$
$du = dx$

(a) $\frac{2}{5}(x+6)^{3/2}(x-4)+c$
(b) $\frac{2}{5}(x-4)^{3/2}(x+6)+c$
(c) $\frac{2}{3}(x+6)^{2/3}(x-4)+c$
(d) $\frac{3}{2}(x-6)^{1/2}(x-1)^{3/2}+c$
(e) $\frac{4}{5}(x+6)^{3/2}(x+16)+c$

$\int (u-6)\sqrt{u}\,du$

$\int (u\sqrt{u} - 6\sqrt{u})\,du$

$= \frac{2}{5}u^{5/2} - 4u^{3/2} + C$

$= \frac{2}{5}(x+6)^{5/2} - 4(x+6)^{3/2} + C$

$\frac{2}{5}(x+6)^{3/2}[x+6-10] + C$

10. $\int \frac{x^4+x-4}{x^2+2}\,dx =$

(a) $\frac{1}{3}x^3 - 2x + \ln\sqrt{x^2+2} + c$
(b) $\frac{1}{2}x^2 - x + 2\ln\sqrt{x^2+2} + c$
(c) $\frac{1}{3}x^3 + \ln|x| + \ln(x^2-4) + c$
(d) $\frac{2}{3}x^3 + \ln|x| + \ln(x^2+2) + c$
(e) $\frac{1}{3}x^3 + 2x + \ln(x^2-4) + c$

$= x^2 - 2 + \frac{x}{x^2+2}$

$= \frac{x^3}{3} - 2x + \frac{1}{2}\ln(x^2+2) + C$

5.7, #21, P

11. $\displaystyle\int_0^{\frac{\pi}{2}} \cos x \sin(\sin x)\, dx =$

(a) $1 - \cos 1$
(b) 0
(c) $\pi - 1$
(d) 1
(e) -1

$u = \sin x$
$du = \cos x\, dx$
$x = 0 \Rightarrow u = \sin 0 = 0$
$x = \frac{\pi}{2} \Rightarrow u = \sin\frac{\pi}{2} = 1$
$\displaystyle\int_0^1 \sin u\, du = \left[-\cos u\right]_0^1$
$= 1 - \cos 1$

12. $\displaystyle\int_{-\frac{\pi}{4}}^{\frac{\pi}{4}} (x^3 + x^4 \tan x)\, dx =$

(a) 0
(b) $\dfrac{\pi}{2}$
(c) $-\dfrac{\pi}{2}$
(d) $\tan^{-1}\left(\dfrac{1}{\sqrt{2}}\right)$
(e) $\left(\dfrac{\pi}{4}\right)^4 \tan^{-1}\left(\dfrac{1}{\sqrt{2}}\right)$

$= 0$
$x^3 + x^4 \tan x$ is an
Odd fun.

13. $\int_{\frac{\pi}{8}}^{\frac{\pi}{4}} (\csc 2\theta - \cot 2\theta)\, d\theta =$

P363, #58

$u = 2\theta \Rightarrow du = 2d\theta$

$\theta = \frac{\pi}{8} \Rightarrow u = \frac{\pi}{4}, \quad \theta = \frac{\pi}{4} \Rightarrow u = \frac{\pi}{2}$

$\frac{1}{2}\int_{\pi/4}^{\pi/2} (\csc u - \cot u)\, du$

(a) $\ln\sqrt{1+\frac{\sqrt{2}}{2}}$

(b) $\frac{1}{2}\ln(\sqrt{2}-1)$

(c) $\frac{1}{4}\ln(\pi-1)$

(d) $\frac{\sqrt{2}}{2}\ln(\pi+1)$

(e) $\frac{1}{2}\ln\left(\frac{\sqrt{2}+\pi}{\sqrt{2}-\pi}\right)$

$= \frac{1}{2}\left[-\ln|\csc u + \cot u| - \ln|\sin u|\right]$

$= \frac{1}{2}\left[-\ln|1+0| - \ln|1| + \ln|\sqrt{2}+1| + \ln\frac{\sqrt{2}}{2}\right]$

$= \ln\sqrt{1+\frac{\sqrt{2}}{2}}$

14. $\int \frac{1}{x\sqrt{x^4-4}}\, dx =$

5.8, #10 / P. 370

$u = x^2 \Rightarrow du = 2x\,dx$

$\int \frac{dx}{x\sqrt{(x^2)^2-4}} = \int \frac{du}{2u\sqrt{u^2-4}}$

(a) $\frac{1}{4}\sec^{-1}\left(\frac{x^2}{2}\right)+c$

(b) $\frac{1}{2}\sin^{-1}\left(\frac{x^2}{4}\right)+c$

(c) $\frac{1}{2}\sec^{-1}\left(\frac{x^2}{4}\right)+c$

(d) $\frac{1}{4}\sin^{-1}\left(\frac{x^2}{2}\right)+c$

(e) $\frac{1}{2}\sin^{-1}\left(\frac{x^2}{2}\right)$

$= \frac{1}{2}\left(\frac{1}{2}\right)\int \frac{du}{u\sqrt{u^2-2^2}}$

$= \frac{1}{4}\sec^{-1}\left(\frac{u}{2}\right) =$

$\frac{1}{4}\sec^{-1}\left(\frac{x^2}{2}\right) + C$

15. $\int \frac{x}{x^4+25}\,dx =$

(a) $\frac{1}{10}\tan^{-1}\left(\frac{x^2}{5}\right)+c$

(b) $\frac{1}{25}\tan^{-1}\left(\frac{x^2}{25}\right)+c$

(c) $\frac{1}{5}\tan^{-1}\left(\frac{x^2}{10}\right)+c$

(d) $\frac{1}{10}\tan^{-1}\left(\frac{x}{5}\right)+c$

(e) $\frac{1}{5}\tan^{-1}\left(\frac{x}{10}\right)+c$

#11, P. 370

$$\int \frac{1}{(x^2)^2+5^2}\,dx$$

$$u=x^2 \Rightarrow 2x\,dx=du$$

$$\frac{1}{2}\int\frac{du}{u^2+25} = \frac{1}{2}\int\frac{\frac{1}{25}\,du}{\frac{u^2}{25}+\frac{25}{25}}$$

$$\frac{1}{2}\int\frac{\frac{1}{25}}{\left(\frac{u}{5}\right)^2+1} = \frac{1}{10}\tan\left(\frac{x^2}{5}\right)+C$$

16. The area of the region bounded between $y_1=(x-1)^3$ and $y_2=x-1$ is equal to

(a) $\frac{1}{2}$

(b) $\frac{1}{4}$

(c) 1

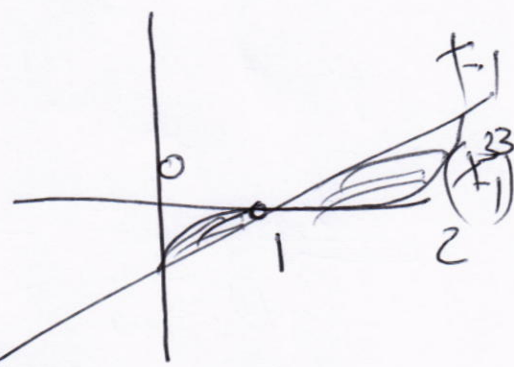
(d) $2\sqrt[3]{2}$

(e) $\frac{1}{2}\sqrt[3]{2}$

#10, P.450

$$(x-1)^3 = x-1 \Rightarrow$$

$$x=0,1,2$$



$$\int_0^1\left((x-1)^3-(x-1)\right)dx$$

$$+\int_1^2\left((x-1)-(x-1)^3\right)dx$$

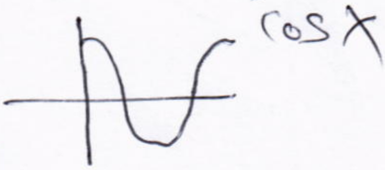
also, $2\int_0^1\left((x-1)^3-(x-1)\right)dx$ $\left\{\begin{array}{l} u=x-1 \\ x=1,\ u=0 \\ x=0,\ u=-1\end{array}\right.$

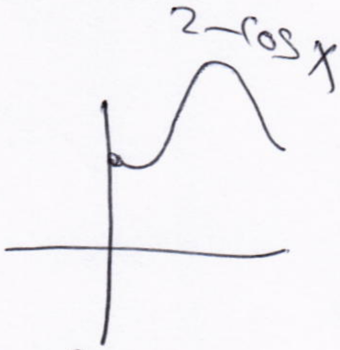
$$\int_{-1}^0(u^3-u)\,du=\left[\frac{u^4}{4}-\frac{u^2}{2}\right]_{-1}^0 \boxed{=1/2}$$

17. If A is the exact region bounded between the two curves $f(x) = \cos x$ and $g(x) = 2 - \cos x$ over the interval $[0, 2\pi]$, then

#37, P 451

(a) $12 < A < 13$
(b) $10 < A < 11$
(c) $9 < A < 10$
(d) $5 < A < 6$
(e) $7 < A < 8$





$$\int_0^{2\pi}\left((2-\cos x)-(\cos x)\right)dx$$

$$= \int_0^{2\pi}(2-2\cos x)\,dx = 2\int_0^{2\pi}(1-\cos x)\,dx$$

$$= 2\Big[x - \sin x\Big]_0^{2\pi} = 2\left[(2\pi - \sin 2\pi) - (0 - \sin 0)\right] = 4\pi \approx 12.5$$

18. $\displaystyle\int_0^{\ln 2} 2e^{-x}\cosh x\,dx =$

#60, P. 381

(a) $\dfrac{3}{8} + \ln 2$
(b) $\dfrac{2+\ln 2}{3}$
(c) $2\ln 2 + e$
(d) $\dfrac{1+\ln 2}{e}$
(e) $e^{-1}\ln 2$

$$\cosh x = e^{x} + e^{-x}/2$$

$$2e^{-x}\cosh x = 1 + e^{-2x}$$

$$\int_0^{\ln 2}(1+e^{-2x})\,dx = \left[x - \frac{e^{-2x}}{2}\right]_0^{\ln 2}$$

$$= \left(\ln 2 - \frac{1}{8}\right) - \left(0 - 1/2\right)$$

$$= \ln 2 + \frac{3}{8}$$