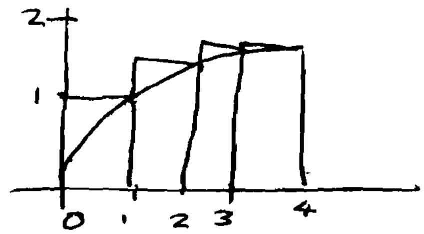
Math 132 - Prof. Richard B. Goldstein - Stewart - 6Ed.

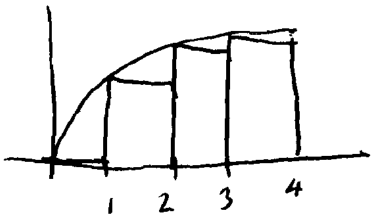
Sect 5.1

#4 $f(x) = \sqrt{x}$ $\quad 0 \le x \le 4$



$R_4 = 1[1 + 1.414 + 1.732 + 2]$

$= \boxed{5.146}$ overestimate



$L_4 = 1[0 + 1 + 1.414 + 1.732] = \boxed{4.146}$ underestimate

#13

t	0	2	4	6	8	10
$r(t)$	8.7	7.6	6.8	6.2	5.7	5.3

$R_5 = 2[7.6 + 6.8 + 6.2 + 5.7 + 5.3]$

$= 2[31.6] = \underline{63.2\ L}$ (lower est)

$L_5 = 2[8.7 + 7.6 + 6.8 + 6.2 + 5.7] = 2[35.0] = \underline{70.0\ L}$ (upper est)

#17 $f(x) = \sqrt[4]{x}$ $\quad 1 \le x \le 16$ $\quad a = 1$ $\quad b = 16$ $\quad \Delta x = \frac{16-1}{n} = \frac{15}{n}$

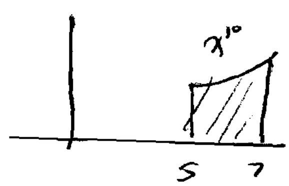
$x_i = 1 + \frac{(16-1)i}{n} = 1 + \frac{15i}{n}$

$$\lim_{n\to\infty} \sum_{i=1}^{n} \left(\sqrt[4]{1 + \frac{15i}{n}}\right)\frac{15}{n}$$

#20 $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \frac{2}{n}\left(5 + \frac{2i}{n}\right)^{10}$ $\quad \frac{b-a}{n} = \frac{2}{n}$ $\quad x_i = 5 + \frac{2i}{n}$

$x_0 = 5 \quad x_n = 5 + 2 = 7$

$$\int_0^2 (5+x)^{10}\,dx \quad \underline{\text{or}} \quad \int_5^7 x^{10}\,dx$$



Sect 5.2

#2 $f(x) = x^2 - 2x$ $\quad 0 \le x \le 3$ $\quad \Delta x = \frac{3-0}{6} = 0.5$

$n = 6$ $\quad x_i = 0 + 0.5i = 0.5i$

$$\sum_{i=1}^{6} 0.5\left[(0.5i)^2 - 2(0.5i)\right] = 0.5\left[\{(0.5)^2 - 2(0.5)\} + \{(1)^2 - 2(1)\} + \ldots + \{(3)^2 - 2(3)\}\right]$$

$= 0.5[-0.75 - 1.00 - 0.75 + 0.00 + 1.25 + 3.00]$

$= 0.5[1.75] = \boxed{0.875}$

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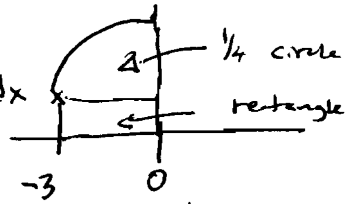
#9 $\int_2^{10} \sqrt{x^3+1}\,dx \quad n=4 \quad h=\frac{10-2}{4}=2$

$\approx 2\left[f(3)+f(5)+f(7)+f(9)\right]$

$\approx 2\left[\sqrt{28}+\sqrt{126}+\sqrt{344}+\sqrt{730}\right] = 2(62.0822) = \boxed{124.1644}$

#37 $\int_{-3}^{0} (1+\sqrt{9-x^2})\,dx$



$A_1 = \frac{1}{4}\pi(3)^2 = \frac{9}{4}\pi$
$A_2 = 3(1) = 3$
$\boxed{3+\frac{9}{4}\pi}$

#47 $\int_{-2}^{2} f(x)\,dx + \int_{2}^{5} f(x)\,dx - \int_{-2}^{-1} f(x)\,dx = \int_{-2}^{5} f(x)\,dx - \int_{-2}^{-1} f(x)\,dx = \boxed{\int_{-1}^{5} f(x)\,dx}$

Sect 5.3

#7 $\frac{d}{dx}\int_1^x \frac{1}{t^3+1}\,dt = \boxed{\frac{1}{x^3+1}}$

#15 $\frac{d}{dx}\int_0^{\tan x} \sqrt{t+\sqrt{t}}\,dt = \boxed{\sqrt{\tan x+\sqrt{\tan x}} \cdot \sec^2 x}$

#23 $\int_0^1 x^{4/5}\,dx = \left.\frac{x^{9/5}}{9/5}\right|_0^1 = \left.\frac{5}{9}x^{9/5}\right|_0^1 = \frac{5}{9} - 0 = \boxed{\frac{5}{9}}$

#29 $\int_1^9 \frac{x-1}{\sqrt{x}}\,dx = \int_1^9 x^{1/2} - x^{-1/2}\,dx = \left.\frac{x^{3/2}}{3/2} - \frac{x^{1/2}}{1/2}\right|_1^9 = \left(\frac{27}{3/2} - \frac{3}{1/2}\right) - \left(\frac{1}{3/2} - \frac{1}{1/2}\right)$

$= (18-6) - \left(\frac{2}{3} - 2\right) = 12 + \frac{4}{3} = \boxed{\frac{40}{3}}$

#54 $g(x) = \int_{\tan x}^{x^2} \frac{1}{\sqrt{2+t^4}}\,dt \qquad g'(x) = \boxed{\frac{1}{\sqrt{2+x^8}} \cdot 2x - \frac{1}{\sqrt{2+\tan^4 x}} \cdot \sec^2 x}$

Sect 5.4

#11 $\int \frac{x^3 - 2\sqrt{x}}{x}\,dx = \int x^2 - 2x^{-1/2}\,dx = \frac{x^3}{3} - \frac{2x^{1/2}}{1/2} + c = \boxed{\frac{x^3}{3} - 4\sqrt{x} + c}$

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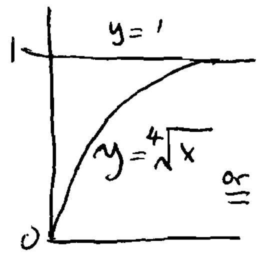
#15 $\int(\theta - \csc\theta\cot\theta)\,d\theta = \boxed{\frac{\theta^2}{2} + \csc\theta + c}$

#41 $\int_0^{1/\sqrt{3}} \frac{t^2-1}{t^4-1}\,dt = \int_0^{1/\sqrt{3}} \frac{1}{t^2+1}\,dt = \arctan x\Big|_0^{1/\sqrt{3}} = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right) - \tan^{-1}(0)$

$= \frac{\pi}{6} - 0 = \boxed{\frac{\pi}{6}}$

#48



or $x = y^4$

$\boxed{A = \int_0^1 y^4\,dy}$

Sect 5.5

#3 $\int x^2\sqrt{x^3+1}\,dx$

$u = x^3+1$

$\frac{du}{dx} = 3x^2$

$du = 3x^2\,dx$

$\int u^{1/2}\,\frac{du}{3} = \frac{u^{3/2}}{3(3/2)} = \frac{2}{9}u^{3/2} + c$

or $\boxed{\frac{2}{9}(x^3+1)^{3/2} + c}$

#5 $\int \cos^3\theta\sin\theta\,d\theta$

$u = \cos\theta$

$\frac{du}{d\theta} = -\sin\theta$

$-du = \sin\theta\,d\theta$

$\int -u^3\,du = -\frac{u^4}{4} + c$

$\boxed{-\frac{\cos^4\theta}{4} + c}$

#17 $\int \frac{a+bx^2}{\sqrt{3ax+bx^3}}\,dx$

$u = 3ax + bx^3$

$\frac{du}{dx} = 3a + 3bx^2$

$\frac{1}{3}du = (a+bx^2)\,dx$

$\int \frac{\frac{1}{3}du}{\sqrt{u}} = \int \frac{1}{3}u^{-1/2}\,du = \frac{1}{3}\,\frac{u^{1/2}}{1/2} + c$

$= \frac{2}{3}\sqrt{u} + c = \boxed{\frac{2}{3}\sqrt{3ax+bx^3} + c}$

#29 $\int e^{\tan x}\sec^2 x\,dx$

$u = \tan x$

$du = \sec^2 x\,dx$

$\int e^u\,du = e^u + c = \boxed{e^{\tan x} + c}$

#67 $\int_e^{e^4} \frac{dx}{x\sqrt{\ln x}}$

$u = \ln x$

$du = \frac{1}{x}dx$

$u(e^4) = \ln(e^4) = 4$

$u(e) = \ln(e) = 1$

$\int_1^4 \frac{du}{u^{1/2}} = \frac{u^{1/2}}{1/2}\Big|_1^4 = \frac{2}{1/2} - \frac{1}{1/2} = 4 - 2 = \boxed{2}$