Homework 5.4.

① $\int 2z^{-3}+3z^{-2}+2z^{-1}\,dz$

$\Rightarrow \frac{2z^{-2}}{-2}+\frac{3z^{-1}}{-1}+2\ln(z)+C$

$\Rightarrow \frac{-1}{z^2}-\frac{3}{z}+2\ln|z|+C$

② $\int \frac{3}{x^7}-5\sqrt[3]{x^2}\,dx$

$\Rightarrow \frac{3x^{-6}}{-6}-\frac{5x^{5/3}}{5/3}+C$ mellow

$\Rightarrow \frac{-1}{2x^6}-3x^{5/3}+C$

③ $\int \frac{7-7xe^x}{x}\,dx \Rightarrow \int \frac{7}{x}-7e^x\,dx$

$\Rightarrow 7\ln|x|-7e^x+C$

④ $f(x)=\frac{5}{x^3}-\frac{8}{x^5}$: $F(1)=0$

$\int \frac{5}{x^3}-\frac{8}{x^5}\,dx = \int 5x^{-3}-8x^{-5}\,dx$

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

$\frac{-5}{2}(1)+2(1)+C=0;\ C=0.5$

$F(x)=\frac{-5}{2}x^{-2}+2x^{-4}+1/2$

⑤ $\int_{2}^{-2}(8x+7)(x-1)\,dx;\ 8x^2-x-7$

$-\int_{-2}^{2}8x^2-x-7\,dx \Rightarrow \left.\frac{8x^3}{3}-\frac{x^2}{2}-7x\right]_{-2}^{2}$

$-\left[\frac{8(2)^3}{3}-\cancel{\frac{2^2}{2}}-7(2)-\frac{8(-2)^3}{3}+\cancel{\frac{(-2)^2}{2}}+7(-2)\right]$

$\Rightarrow -14.667$

⑥ $f(x)=\begin{cases} x & x<1 \\ 1/x & x\geq 1\end{cases}$: $\int_{-4}^{4}f(x)\,dx$

$\Rightarrow \int_{-4}^{1}x\,dx+\int_{1}^{4}1/x\,dx \Rightarrow \left.\frac{x^2}{2}\right]_{-4}^{1}+\left.\ln x\right]_{1}^{4}$

$\frac{(1)^2}{2}-\frac{(-4)^2}{2}+\ln|4|-\cancel{\ln|1|}\approx -6.114$

⑦ $\int_0^1 u(\sqrt[3]{u}+\sqrt[8]{u})\,du \Rightarrow \int_0^1 u^{4/3}+u^{9/8}\,du$

$\left.\frac{u^{7/3}}{7/3}+\frac{u^{17/8}}{17/8}\right]_0^1 \rightarrow \frac{3}{7}u^{7/3}+\frac{8}{17}u^{17/8}$

answer is $\Rightarrow \frac{3}{7}+\frac{8}{17}\approx 0.9$

⑧ $\int_0^{\pi/3}3\cos\theta+3\sin\theta\,d\theta$

$\left.3\sin\theta-3\cos\theta\right]_0^{\pi/3}$

$3\sin(\frac{\pi}{3})-3\cos(\frac{\pi}{3})-\cancel{3\sin(0)}+3\cos(0)$

$\Rightarrow \frac{3\sqrt{3}}{2}-\frac{3}{2}+3\approx 4.1$

⑨ $\int_{-1}^{7}|x-4x^2|\,dx \Rightarrow f(x)=x-4x^2$

$\Rightarrow -\int_{-1}^{0}f(x)\,dx+\int_{0}^{1/4}f(x)\,dx-\int_{1/4}^{7}f(x)\,dx$

$\left.-\frac{x^2}{2}+\frac{4x^3}{3}\right]_{-1}^{0}+\left.\frac{x^2}{2}-\frac{4x^3}{3}\right]_{0}^{1/4}-\left.\frac{x^2}{2}+\frac{4x^3}{3}\right]_{1/4}^{7}$

$\cancel{\left(\frac{-(0)^2}{2}+\frac{4(0)^3}{3}\right)}-\left(\frac{-(-1)^2}{2}+\frac{4(-1)^3}{3}\right)=\frac{11}{6}$

$\left(\frac{(1/4)^2}{2}-\frac{4(1/4)^3}{3}\right)-\cancel{\left(\frac{(0)^2}{2}-\frac{4(0)^3}{3}\right)}=\frac{1}{96}$

$\left(\frac{-(7)^2}{2}+\frac{4(7)^3}{3}\right)-\left(\frac{-(1/4)^2}{2}+\frac{4(1/4)^3}{3}\right)=\frac{13851}{32}$

Area $= 6955/16$

Homework 5.4:

(10) $\int_3^5 7f(x)+7\,dx=3$

$7\int_3^5 f(x)\,dx+\int_3^5 7\,dx=3$

$\int_3^5 f(x)\,dx=\frac{3-7(2)}{7}$

(11) $v(t)=-t^2+6t-8$

$t^2-6t+8=0;\ (t-4)(t-2)$

$\vec{s}=\int_{-1}^{5}-t^2+6t-8\,dt=\left.\frac{-t^3}{3}+\frac{6t^2}{2}-8t\right]_{-1}^{5}$

$\frac{-(5)^3}{3}+\frac{6(5)^2}{2}-8(5)+\frac{(-1)^3}{3}-\frac{6(-1)^2}{2}-8(-1)$

displacement ≈ -18

$-\int_{-1}^{2}v(t)\,dt+\int_{2}^{4}v(t)\,dt-\int_{4}^{5}v(t)\,dt$

$\left.\frac{t^3}{3}-\frac{6t^2}{2}+8t\right]_{-1}^{2}+\left.\frac{-t^3}{3}+\frac{6t^2}{2}-8t\right]_{2}^{4}+\left.\frac{t^3}{3}-6\frac{t^2}{2}+8t\right]_{4}^{5}$

used calculator $=\frac{62}{3}\approx 20.67$

(12) $\int_7^{10} 500+50t\,dt \Rightarrow \left.500t+25t^2\right]_7^{10}$

$500(10)+25(100)-500(7)-25(49)\approx 2775$