Section 5.4

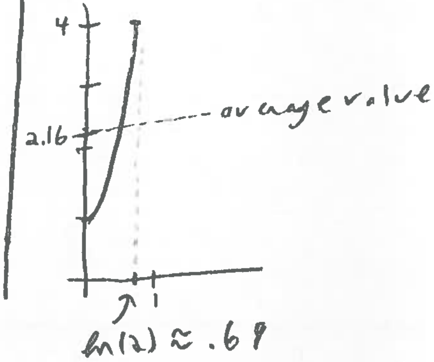
(26) Average value of $f(x)=e^{2x}$ on $[0, \ln 2]$

is $\frac{1}{\ln(2)-0}\int_0^{\ln 2} e^{2x}\,dx = \frac{1}{\ln(2)}\cdot\frac{1}{2}e^{2x}\Big|_0^{\ln 2}$

$= \frac{1}{2\ln(2)}\left[e^{2\ln 2}-e^{2\cdot 0}\right]$

$= \frac{1}{2\ln(2)}\cdot[4-1] = \underline{\underline{\frac{3}{2\ln 2}}} \approx 2.16$

$e^{2\ln 2} = e^{\ln 2^2}$
$= e^{\ln 4} = 4$



(34) Average value of $5(1+\cos x)$, on $[-\pi, \pi]$

$= \frac{1}{\pi-(-\pi)}\int_{-\pi}^{\pi} 5(1+\cos x)\,dx = \frac{5}{2\pi}\int_{-\pi}^{\pi} 1+\cos x\,dx$

$= \frac{5}{2\pi}\left[x+\sin(x)\Big|_{-\pi}^{\pi}\right] = \frac{5}{2\pi}\left[(\pi+\sin(\pi))-(-\pi+\sin(-\pi))\right]$

$= \frac{5}{2\pi}\left[(\pi+0)-(-\pi+0)\right] = \frac{5}{2\pi}\cdot 2\pi = \underline{\underline{5}}.$

Section 5.5

(18) $\int x e^{x^2}\,dx$ Let $w = x^2$
$dw = 2x\,dx$

$= \frac{1}{2}\int e^{x^2}\cdot 2x\,dx$

$= \frac{1}{2}\int e^{w}\,dw$

$= \frac{1}{2}e^{w}+C$

$= \underline{\underline{\frac{1}{2}e^{x^2}+C}}$

(46) $\int_0^{\pi/4}\frac{\sin\theta}{\cos^3\theta}\,d\theta$

$\int \frac{\sin\theta}{\cos^3\theta}\,d\theta$ $w = \cos\theta$
$dw = -\sin\theta\,d\theta$

$= -\int \frac{1}{\cos^3\theta}\cdot(-\sin\theta\,d\theta)$

$= -\int w^{-3}\,dw = -\frac{w^{-3+1}}{-3+1}+C$

$= \frac{1}{2}w^{-2} = \frac{1}{2\cos^2\theta}+C$

$\int_0^{\pi/4}\frac{\sin\theta}{\cos^3\theta}\,d\theta = \frac{1}{2\cos^2\theta}\Big|_0^{\pi/4}$

$= \frac{1}{2\cos^2\frac{\pi}{4}} - \frac{1}{\cos^2 0} = \frac{1}{2\cdot\left(\frac{\sqrt{2}}{2}\right)^2}-\frac{1}{2} = \underline{\underline{\frac{1}{2}}}$

(90) $\int_1^{e^2} \frac{\ln p}{p}\,dp \longrightarrow \int \frac{\ln p}{p}\,dp$ Let $w = \ln p$, $dw = \frac{1}{p}\,dp$

$= \int w\,dw$

$= \frac{w^2}{2} + C$

$= \frac{1}{2}(\ln p)^2 + C$

$= \frac{1}{2}(\ln p)^2 \Big|_1^{e^2}$

$= \frac{1}{2}((\ln e^2)^2 - \ln 1^2)$

$= \frac{1}{2}\cdot(2^2 - 0)$

$= 2$

(90) $\int \tan x\,dx = \int \frac{\sin x}{\cos x}\,dx$ let $w = \cos x$, $dw = -\sin(x)\cdot dx$

$= -\int \frac{1}{w}\,dw = -\ln|w| + C = -\ln|\cos x|$

$\int \cot x\,dx = \int \frac{\cos x}{\sin x}\,dx$ let $w = \sin(x)$, $dw = \cos x\,dx$

$= \int \frac{1}{w}\,dw = \ln|w| + C = \ln|\sin x| + C$

(106) $\int x \sin^4 x^2 \cos x^2\,dx$ Let $w = x^2$, $dw = 2x\,dx$

$= \frac{1}{2}\int \sin^4(x^2)\cos(x^2)\cdot 2x\,dx$

$= \frac{1}{2}\int \sin^4(w)\cos(w)\,dw$ Let $v = \sin(w)$, $dv = \cos(w)\,dw$

$= \frac{1}{2}\int \sin^4(w)\cdot(-\cos(w)\,dw)$

$= \frac{1}{2}\int v^4\,dv$

$= \frac{1}{2}\cdot\frac{v^5}{5} + C$

$= \frac{1}{10}v^5 + C = \frac{1}{10}(\sin(w))^5 + C = \frac{1}{10}\sin^5(x^2) + C$