4.4 #45-51 odd; 75-91 odd
4.5 #7-33 odd; 41-53 odd; 57-75 odd
5.2 #1-35 odd; 43-53 odd; 61, 63
5.4 #87-107 odd
5.5 #61-68 all
5.9 #1-41 odd
Ch 5 Review pp.405-407 #17-24, 49-56,71-72, 99-106

Test #2 - Tues, 15 Dec.

1. $\sec^3 x$

2. $\sqrt{\sin x} \cdot \cos x$

3. $\dfrac{-1}{3(1+x^3)} + C$

4. $\frac{1}{5}\tan^5 x + C$

5. $12 - \dfrac{8\sqrt{2}}{9}$

≈ 10.74

3. $$\int \frac{x^2}{(1+x^3)^2}\,\cancel{dx} = \int \frac{1}{3}\cdot\frac{1}{u^2}\,du$$

$u = 1 + x^3$

$du = 3x^2\,dx$

$\frac{1}{3}du = x^2\,dx$

$$= \int \frac{1}{3}u^{-2}\,du$$

$$= -\frac{1}{3}u^{-1} + C$$

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

5. $$\int_1^2 2x^2\sqrt{x^3+1}\,\cancel{dx} = \int_{x=1}^{x=2} \frac{2}{3}\sqrt{u}\,du$$

$u = x^3 + 1$

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

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

$$= \int_{x=1}^{2} \frac{2}{3}u^{1/2}\,du$$

$$= \frac{2}{3}\cdot\frac{2}{3}u^{3/2}\Big|_{x=1}^{2}$$

$$= \frac{4}{9}(x^3+1)^{3/2}\Big|_1^2$$

$$= \frac{4}{9}\left(\sqrt{2^3+1}\right)^3 - \frac{4}{9}\sqrt{(1^3+1)^3}$$

$$= \frac{4}{9}\cdot 3^3 - \frac{4}{9}\sqrt{8}$$

$$= \frac{4}{\cancel{9}}\,\overset{3}{\cancel{27}} - \frac{4}{9}\cdot 2\sqrt{2}$$

$$= 12 - \frac{8\sqrt{2}}{9}$$

5.2 #7

$\log_a b^c = c\log_a b$

$$\int \frac{x}{x^2+1}\,dx = \int \frac{1}{2}\cdot\frac{1}{u}\,du$$

$u = x^2+1$

$du = 2x\,dx$

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

$$= \frac{1}{2}\ln|u| + c$$

$$= \frac{1}{2}\ln(x^2+1) + c$$

$$= \ln\sqrt{x^2+1} + C$$

5.2 #53

$1+\tan^2 x = \sec^2 x$

$$\int \sec x\,dx = \ln|\sec x + \tan x| + C$$

$$\int \sec x\,dx = -\ln|\sec x - \tan x| + C$$

$$\ln\left[\frac{1}{|\sec x - \tan x|}\cdot\frac{\sec x+\tan x}{\sec x+\tan x}\right] = \ln\left[\frac{\sec x+\tan x}{\sec^2 x-\tan^2 x}\right]$$

$$= \ln\left[\frac{\sec x+\tan x}{1+\tan^2 x-\tan^2 x}\right] = \ln|\sec x+\tan x| + C$$

42. $$\int \frac{x}{\sqrt{9+8x^2-x^4}}\,dx$$

$$-x^4+8x^2+9$$

$$-(x^4-8x^2+16)+9+16$$

$$-(x^2-4)^2+25$$

$$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a}+c$$

$$\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a}+c$$

$$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a}+c$$

$$\int \frac{x}{\sqrt{25-(x^2-4)^2}}\,dx$$

$u=x^2-4$

$du=2x\,dx$

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

$$=\int \frac{1}{2}\frac{du}{\sqrt{5^2-u^2}} = \boxed{\frac{1}{2}\arcsin\frac{x^2-4}{5}+c}$$

40. $$\int \frac{1}{(x-1)\sqrt{x^2-2x}}\,dx$$

$$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a}+c$$

$$\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a}+c$$

$$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a}+c$$

$$x^2-2x+1-1$$

$$(x-1)^2-1$$

$u=x-1$

$du=dx$

$$\int \frac{1}{(x-1)\sqrt{(x-1)^2-1}}\,dx = \int \frac{du}{u\sqrt{u^2-1^2}} = \boxed{\operatorname{arcsec}|x-1|+c}$$

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$$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a} + c$$
$$\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a} + c$$
$$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a} + c$$

100. $\int \frac{1}{3+25x^2}\,dx$

$= \int \frac{1}{(\sqrt{3})^2+(5x)^2}\,dx = \int \frac{1}{5}\cdot\frac{1}{(\sqrt{3})^2+u^2}\,du$

$u = 5x$
$du = 5dx$
$\frac{1}{5}du = dx$

$= \frac{1}{5}\,\frac{1}{\sqrt{3}}\arctan\frac{5x}{\sqrt{3}} + c$

$= \frac{1}{5\sqrt{3}}\arctan\frac{5x}{\sqrt{3}} + C$

$= \boxed{\frac{\sqrt{3}}{15}\arctan\frac{5x\sqrt{3}}{3} + C}$

104. $\int \frac{4-x}{\sqrt{4-x^2}}\,dx$

$$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a} + c$$
$$\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a} + c$$
$$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a} + c$$

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

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

$= 4\cdot\arcsin\frac{x}{2} + \int \frac{-x}{\sqrt{4-x^2}}dx + c$

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

$= 4\arcsin\frac{x}{2} + \frac{1}{2}\int \frac{du}{\sqrt{u}} + c$

$= 4\arcsin\frac{x}{2} + \frac{1}{2}\int u^{-1/2}\,du + C$

$= 4\arcsin\frac{x}{2} + \frac{1}{2}\cdot 2u^{1/2} + c$

$= \boxed{4\arcsin\frac{x}{2} + \sqrt{4-x^2} + c}$

$$\int \frac{du}{\sqrt{a^2-u^2}} = \arcsin\frac{u}{a} + c$$

$$\int \frac{du}{a^2+u^2} = \frac{1}{a}\arctan\frac{u}{a} + c$$

$$\int \frac{du}{u\sqrt{u^2-a^2}} = \frac{1}{a}\operatorname{arcsec}\frac{|u|}{a} + c$$

105. $\displaystyle\int \frac{\arctan(x/2)}{4+x^2}\,dx$

$u = \arctan\frac{x}{2}$

$du = \dfrac{1}{1+\left(\frac{x}{2}\right)^2}\cdot\frac{1}{2}\,dx$

$2du = \dfrac{1}{1+\frac{x^2}{4}}\,dx$

$2du = \dfrac{1}{1+x^2/4}\cdot\frac{4}{4}\,dx$

$2du = \dfrac{4\,dx}{4+x^2}$

$\dfrac{du}{2} = \dfrac{dx}{4+x^2}$

$= \displaystyle\int \frac{1}{2}u\,du$

$= \dfrac{1}{2}\dfrac{u^2}{2} + c$

$= \boxed{\dfrac{1}{4}\arctan^2\dfrac{x}{2} + c}$