HW 3 solutions MAT 17 B

Section 6.2 pg 305

41. $\int\left(\frac{1}{3}x^2 - \frac{1}{2}x\right)dx = \boxed{\frac{x^3}{9} - \frac{x^2}{4} + C}$

(Use the rule $\int x^n dx = \frac{x^{n+1}}{n+1} + C$)

45. $\int \frac{2x^2 - x}{\sqrt{x}} dx = \int \frac{2x^2}{\sqrt{x}} - \frac{x}{\sqrt{x}} dx$

$= \int 2\left(x^{(2-\frac{1}{2})}\right) - \left(x^{(1-\frac{1}{2})}\right)dx$

$= \int 2x^{3/2} - x^{1/2} dx = \boxed{2\frac{x^{5/2}}{5/2} - \frac{x^{3/2}}{3/2} + C}$

55. $\int (x-2)(3-x)\,dx = \int (3x - 6 - x^2 + 2x)\,dx$ [clearing the parantheses]

$= \boxed{\frac{3x^2}{2} - 6x - \frac{x^3}{3} + x^2 + C}$

62. $\int e^x(1-e^{-x})\,dx = \int (e^x - e^x e^{-x})dx = \int (e^x - 1)dx$

$= \boxed{e^x - x + C}$

65. $\int \cos(3x)\,dx = \boxed{\dfrac{\sin(3x)}{3} + C}$

Using Table 5-1.

67. $\int \sec^2(3x)\,dx = \boxed{\dfrac{\tan(3x)}{3} + C}$

Using Table 5-1.

70. $$\int \frac{\cos x}{1-\cos^2 x}\,dx = \int \frac{\cos x}{\sin^2 x}\,dx \quad \left[\text{Using } 1-\cos^2 x = \sin^2 x\right]$$

$$= \int \frac{\cos x}{\sin x} \cdot \frac{1}{\sin x}\,dx$$

$$= \int \cot x \csc x\,dx \qquad \boxed{\text{Using Table 6-1}}$$

$$= \boxed{-\csc x + C}$$

73. $$\int (\sec^2 x + \tan x)\,dx = \int \sec^2 x\,dx + \int \tan x\,dx$$

$$= \boxed{\tan x + \ln|\sec x| + C}$$

Using Table 6.1

75. $\displaystyle\int \frac{4}{1+x^2}\,dx = 4\int \frac{1}{1+x^2}\,dx$

$= \boxed{4\tan^{-1}x + C}$

76. $\displaystyle\int \left(1 - \frac{x^2}{1+x^2}\right)dx = \int \frac{1+x^2-x^2}{1+x^2}\,dx$

$\displaystyle= \int \frac{1}{1+x^2}\,dx$

$= \boxed{\tan^{-1}x + C}$

82. $\displaystyle\int \frac{2x+5}{x}\,dx = \int \frac{2x}{x} + \frac{5}{x}\,dx$

$\displaystyle= \int\left(2 + \frac{5}{x}\right)dx = \int 2dx + \int \frac{5}{x}\,dx$

$= \boxed{2x + 5\ln|x| + C}$

95. $\displaystyle\int\left(\sqrt{x} + \sqrt{e^x}\right)dx = \int\left(x^{1/2} + (e^x)^{1/2}\right)dx = \int\left(x^{1/2} + e^{x/2}\right)dx$

$\displaystyle= \boxed{\frac{x^{1/2+1}}{1/2+1} + \frac{e^{x/2}}{(1/2)} + C}$

102. $\displaystyle\int_4^9 \frac{1+\sqrt{x}}{\sqrt{x}}\,dx$

$$= \int_4^9 \left(\frac{1}{\sqrt{x}} + 1\right) dx$$

antiderivative of $\frac{1}{\sqrt{x}} + 1$ is $2\sqrt{x} + x$ using the power rule.

$$\therefore \int_4^9 \left(\frac{1}{\sqrt{x}}+1\right) dx = \left(2\sqrt{9}+9\right) - \left(2\sqrt{4}+4\right)$$

$$= 15 - 8 = 7$$

56. $\displaystyle\int (2x+3)^2\,dx = \int \left(4x^2 + 9 + 12x\right) dx$ (clearing the square)

$$= \boxed{\frac{4x^3}{3} + 9x + \frac{12x^2}{2} + C}$$

110. $\displaystyle\int_{-\sqrt{3}}^{-1} \frac{4}{1+x^2}\,dx$ Using $\displaystyle\int \frac{1}{1+x^2}\,dx = \tan^{-1}x + C$ $\boxed{4\tan^{-1}(-1) - 4\tan^{-1}(-\sqrt{3})}$

111. $\displaystyle\int_0^{1/2} \frac{1}{\sqrt{1-x^2}}\,dx = \sin^{-1}\frac{1}{2} - \sin^{-1}0 = \frac{\pi}{6} - 0$

Using $\displaystyle\int \frac{1}{\sqrt{1-x^2}}\,dx = \sin^{-1}x$

$= \pi/6$

119. $\displaystyle\int_1^{e} \frac{1}{x}\,dx = \ln|e| - \ln|1| = 1$