5.3 Practice Problems

1 $I = \int_2^4 \frac{1}{x} + \frac{1}{x^2}\,dx = \int_2^4 \frac{1}{x} + x^{-2}\,dx$

$= \ln|x| + \frac{x^{-1}}{-1}\Big|_2^4 = \ln x - \frac{1}{x}\Big|_2^4$

$= (\ln 4 - \frac{1}{4}) - (\ln 2 - \frac{1}{2})$

$= \ln 4 - \ln 2 + \frac{1}{2} - \frac{1}{4} = \ln 2 + \frac{1}{4}$

2 $I = \int_0^1 x^{3/7} - x^{-2/11}\,dx = \frac{x^{10/7}}{10/7} - \frac{x^{9/11}}{9/11}\Big|_0^1$

$= \frac{7}{10}x^{10/7} - \frac{11}{9}x^{9/11}\Big|_0^1$

$= (\frac{7}{10} - \frac{11}{9}) - (0-0) = \frac{63-110}{90} = -\frac{47}{90}$

3 $I = \int_{-3}^2 x^3 + x^2 - 3\,dx = \frac{x^4}{4} + \frac{x^3}{3} - 3x\Big|_{-3}^2$

$= (\frac{2^4}{4} + \frac{2^3}{3} - 6) - (\frac{(-3)^4}{4} + \frac{(-3)^3}{3} + 9)$

$= (4 + \frac{8}{3} - 6) - (\frac{81}{4} - 9 + 9)$

$= -2 - \frac{73}{4} = -\frac{81}{4}$

4 $I = \int_1^9 x^{-3/2}\,dx = \frac{x^{-1/2}}{-1/2}\Big|_1^9 = -2\frac{1}{\sqrt{x}}\Big|_1^9$

$= (-2\frac{1}{3}) - (-2\frac{1}{1}) = -\frac{2}{3} + 2 = \frac{4}{3}$

5 $I = \int_6^2 e^x\,dx = e^x\Big|_6^2 = e^2 - e^6$

you could, but don't need, to do this:

$I = -\int_2^6 e^x\,dx = -e^x\Big|_2^6 = -e^6 - (-e^2) = e^2 - e^6$

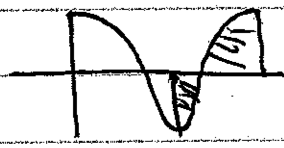
2

6 $I = \int_{-10}^{-3} \frac{1}{x}\,dx = \ln|x| \Big|_{-10}^{-3} = \ln|-3| - \ln|10|$

$= \ln 3 - \ln 10 = \ln\left(\frac{3}{10}\right)$

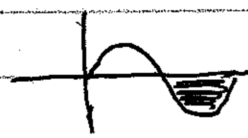
7 $I = \int_{\pi}^{2\pi} 4\cos x\,dx = 4\sin x \Big|_{\pi}^{2\pi} = 4\sin 2\pi - 4\sin\pi$

$= 0 - 0 = 0$



8 $I = \int_{\pi}^{2\pi} 5\sin x\,dx = -5\cos x \Big|_{\pi}^{2\pi} = (-5\cos 2\pi) - (-5\cos\pi)$

$= (-5) - (+5) = -10$



9 $I = \int_0^{\pi} \sin x\,dx) = -\cos x \Big|_0^{\pi} = (-\cos\pi) - (-\cos 0)$

$= +1 - (-1) = 2$

10 $I = \int_0^1 \sec x\tan x\,dx = \sec x \Big|_0^1 = \sec 1 - \sec 0$

$= \sec 1 - 1$

note: $\sec 1 = \frac{1}{\cos 1} = \frac{1}{.54} = 1.85$

11 $I = \int_{\pi/2}^{2} \csc^2 x\,dx = -\cot x \Big|_{\pi/2}^{2} = (-\cot 2) - (-\cot\frac{\pi}{2})$

$= -\cot 2$

12 $I = \int_1^3 \frac{1}{1+x^2}\,dx = \tan^{-1} x \Big|_1^3 = \tan^{-1} 3 - \tan^{-1} 1$

$= \tan^{-1} 3 - \frac{\pi}{4}$

13 $g(x) = \int_{6}^{2x-1} \frac{t}{t^2+1}\,dt$

$g'(x) = \left[\frac{2x-1}{(2x-1)^2+1}\right][2]$

14 $g(x) = \int_{x^3}^{5} t^4 + t^2 + 1\,dt$

$g'(x) = -[x^{12} + x^6 + 1][3x^2]$

15 $g(x) = \int_{-3}^{4x+1} \frac{t^2}{\sin t + 3t}\,dt$

$g'(x) = \left[\frac{(4x+1)^2}{\sin(4x+1) + 3(4x+1)}\right][4]$

16 $g(x) = \int_{0}^{e^{2x}} e^t + \ln t\,dt$

$g'(x) = [e^{e^{2x}} + \underbrace{\ln(e^{2x})}_{2x}][2e^{2x}]$

17 $g(x) = \int_{\cos x}^{\ln x} \frac{1}{\sqrt{t^2+1}}\,dt$

$g'(x) = \left[\frac{1}{\sqrt{(\ln x)^2+1}}\right]\left[\frac{1}{x}\right] - \left[\frac{1}{\sqrt{\cos^2 x + 1}}\right][-\sin x]$

18 $g(x) = \int_{2x}^{5x} e^t\,dt$

$g'(x) = [e^{5x}][5] - [e^{2x}][2]$