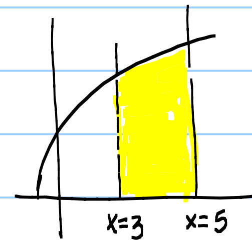
More Integration Practice

Note Title 10/05/2012

Eg#1 $\displaystyle\int_3^5 \sqrt{2x+1}\,dx$



$\displaystyle\int_3^5 (2x+1)^{1/2}\,dx = \frac{1}{3}(2x+1)^{3/2}\Big|_3^5$

$\frac{1}{3}(2x+1)^{3/2}$

$\frac{1}{3}\frac{3}{2}(2x+1)^{1/2}(2)$

$\frac{1}{3}3(2x+1)^{1/2}$

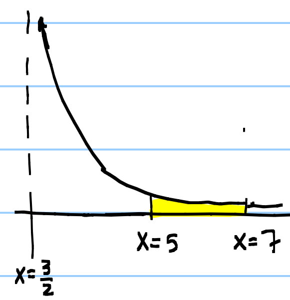
$(2x+1)^{1/2}$ ✓

$\frac{1}{3}(11)^{3/2} - \frac{1}{3}(7)^{3/2}$

$\frac{1}{3}(11\sqrt{11}) - \frac{1}{3}(7\sqrt{7}) =$

$\frac{1}{3}\left[11\sqrt{11} - 7\sqrt{7}\right]$

Eg#2 $\displaystyle\int_5^7 \frac{1}{(2x-3)^2}\,dx$



$\displaystyle\int_5^7 (2x-3)^{-2}\,dx = -\frac{1}{2}(2x-3)^{-1}\Big|_5^7$

$= -\frac{1}{2}(11)^{-1} - -\frac{1}{2}(7)^{-1} = -\frac{1}{22} + \frac{1}{14} = \frac{2}{77}$

$(2x-3)^{-1}$

$-1(2x-3)^{-2}(2)$

$-2(2x-3)^{-2}$

Eg#3 $\displaystyle\int_0^{\pi/3} 3\sec^2\left(\tfrac{1}{2}x\right)dx = 6\tan\left(\tfrac{1}{2}x\right)\Big|_0^{\pi/3}$

$6\tan\left(\tfrac{1}{2}x\right)$

$6\sec^2\left(\tfrac{1}{2}x\right)\cdot\tfrac{1}{2}$

$6\left(\tfrac{1}{2}\sec^2\left(\tfrac{1}{2}x\right)\right)$

$6\tan\left(\frac{\pi}{6}\right) - 6\tan(0) = 6\left(\frac{1}{\sqrt{3}}\right) - 6(0)$

$= \frac{6}{\sqrt{3}}$ or 3.464

Eg#4 $\int_1^5 \frac{2}{3x-1}\,dx = \frac{2}{3}\ln(3x-1)\Big|_1^5$

$\frac{2}{3}\ln(3x-1)$

$\frac{2}{3}\left(\frac{1}{3x-1}\cdot 3\right) = \frac{\cancel{2}/\cancel{3}(3)}{3x-1}$

$\frac{2}{3}\ln(14) - \frac{2}{3}\ln(2) = \frac{2}{3}\ln 7 \doteq 1.3$

Eg#5 $\int_1^4 \frac{3}{x}\,dx = 3\ln(x)\Big|_1^4 = 3\ln(4) - 3\ln(1) = 3\ln 4$

or 4.159

Eg#6 $\int_1^4 \frac{5}{x^2}\,dx = \int_1^4 5x^{-2}\,dx = -5x^{-1}\Big|_1^4$

$-5x^{-1}$

$-5(-1x^{-2})$

$5x^{-2}$

$= -5(4)^{-1} - -5(1)^{-1}$

$= -\frac{5}{4} + 5 = 3\frac{3}{4}$ or 3.75

Eg#7 $\int_0^{\pi/3} \cos(3x)\,dx = \frac{1}{3}\sin(3x)\Big|_0^{\pi/3}$

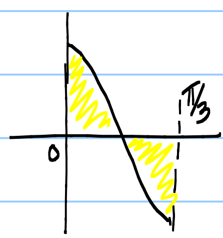
$\frac{1}{3}[\sin(3x)]$

$\frac{1}{3}[\cos(3x)\cdot 3]$

$\cos(3x)$

$= \frac{1}{3}\sin(3\cdot\pi/3) - \frac{1}{3}\sin(3\cdot 0) = \frac{1}{3}\sin(\pi) - \frac{1}{3}\sin(0)$

$= 0 - 0 = 0$



Eg#8 $\int_{-1}^3 e^{4x}\,dx = \frac{1}{4}e^{4x}\Big|_{-1}^3$

$\frac{1}{4}e^{4x}$

$\frac{1}{4}(\cancel{\text{the}})(e^{4x})(4)$

$\frac{1}{4}(4e^{4x})$

e^{4x}

$= \frac{1}{4}e^{12} - \frac{1}{4}e^{-4}$

$= \frac{1}{4}[e^{12} - e^{-4}]$

Eg#9 $\displaystyle\int_0^4 2^{x+4}\,dx = \frac{1}{\ln 2}\, 2^{x+4}\Big|_0^4$

$\frac{1}{\ln 2}\, 2^{x+4}$

$\frac{1}{\ln 2}(\ln 2)(2^{x+4})(1)$

$= \frac{1}{\ln 2}\, 2^8 - \frac{1}{\ln 2}\, 2^4$

Eg#10 $\displaystyle\int_{+1}^{6} \frac{4}{8x+2}\,dx = \frac{1}{2}\ln(8x+2)\Big|_{+1}^{6}$

$\frac{1}{2}[\ln(8x+2)]$

$\frac{1}{2}\left[\frac{1}{8x+2}\cdot 8\right]$

$= \frac{1}{2}\ln(50) - \frac{1}{2}\ln(10)$

$= \frac{1}{2}\ln(5)$

Practice: p 298 # 15-24

p 286 # 1-12, 25-28