7.2 Day 3

Tuesday, February 7, 2017 8:18 AM

U-sub with Definite Integrals

- Opener 7.2 warm up practice
- notes
- U-sub practice sheet (if time)

Evaluate:

a. $\int_0^{\frac{\pi}{2}} \cos x\, e^{\sin x}\, dx$

$u = \sin x$

$du = \cos x\, dx$

$u = \cos x$

$du = -\sin x\, dx$

$-du = \sin x\, dx$

$-du = \sin x\, dx$

$u(\frac{\pi}{2}) = \sin\frac{\pi}{2} = 1$

$u(0) = \sin(0) = 0$

$= \int_0^1 e^u du = e^u\Big|_0^1$

$= e^1 - e^0 = \boxed{e-1}$

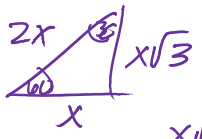
~~$= e^u + C\Big|_0^1 = (e^1 + C) - (e^0 + C)$~~

b. $\int_0^{\frac{\pi}{3}} \tan x \sec^2 x\, dx$

$u = \tan x$ $du = \sec^2 x\, dx$

$u(\frac{\pi}{3}) = \sqrt{3}$

$u(0) = 0$



$\frac{x\sqrt{3}}{x} = \sqrt{3}$

$\int_0^{\sqrt{3}} u\, du = \frac{u^2}{2}\Big|_0^{\sqrt{3}} = \frac{\sqrt{3}^2}{2} - \frac{0^2}{2} = \frac{3}{2}$

c. $\int_{\frac{\pi}{3}}^{\frac{5\pi}{6}} \cos^2 x \sin x\, dx$

$\sqrt{3}$

$u = \cos x$

$du = -\sin x\, dx$

$u(\frac{5\pi}{6}) = -\frac{\sqrt{3}}{2}$

$-du = \sin x\, dx$

$u(\frac{\pi}{3}) = \frac{1}{2}$

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$u(\frac{\pi}{3}) = \frac{1}{2}$

$$-\int_{1/2}^{-\frac{\sqrt{3}}{2}} u^2\,du = \frac{-u^3}{3}\Big|_{1/2}^{\frac{\sqrt{3}}{2}} = \frac{-\left(-\frac{\sqrt{3}}{2}\right)^3}{3} - \left(\frac{-\left(\frac{1}{2}\right)^3}{3}\right)$$

$$= \frac{\frac{3\sqrt{3}}{8}}{3} + \frac{\frac{1}{8}}{3} = \frac{3\sqrt{3}}{24} + \frac{1}{24}$$

$$\frac{3\sqrt{3}+1}{24}$$