Calculus I, Fall 2023 (Thomas' Calculus Early Transcendentals 13ed), http://www.math.nthu.edu.tw/~wangwc/

## Brief solutions to selected problems in homework 14

1. Section 7.3: Solutions, common mistakes and corrections:

tan'(sinhx (OS 5 cosh 05

Figure 1: Solution to Section 7.3, problem 37(a)

if  $y = \sin(tanhX) + C$ then  $y' = \frac{\operatorname{Sech}^{2}X}{1}$ 1-tanhx Sech'x Sech'x = SechX sechada = M

Figure 2: Solution to Section 7.3, problem 37(b)

Stanh  $\frac{1}{7}dx$ =  $S7 tanh(n) \frac{1}{7}dx$ = S7 tanh(n) dndx tanh (n) dn =7

Figure 3: Solution to Section 7.3, problem 45

2. Section 7.4: Solutions, common mistakes and corrections:

faster : e, h, dSame : c, f, bSlower : X, g200

Figure 4: Solution to Section 7.4, problem 5

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Figure 5: Solution to Section 7.4, problem 7

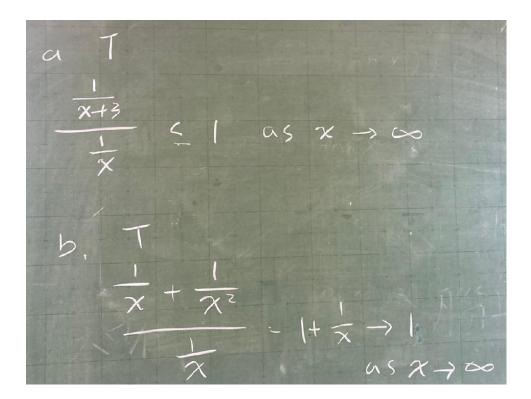


Figure 6: Solution to Section 7.4, problem 10(a,b)

C.F fim = | = 0 d 2+ CosX 53 X is sufficiently 2 t Cos X large

Figure 7: Solution to Section 7.4, problem 10(c,d)

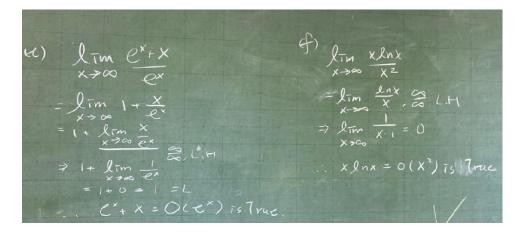


Figure 8: Solution to Section 7.4, problem 10(e,f)

 $\frac{l_n(l_n\chi)}{l_n\chi} < \frac{q_n\chi}{l_n\chi} = 1$ for large X (h)  $\lim_{X \to \infty} \frac{l_n X}{l_n (X^2 + l)}$ 

Figure 9: Solution to Section 7.4, problem 10(g,h)

n, sh log.n, llog.n)  $\int \frac{h}{\sqrt{n}\log_2 n} = \lim_{n \to \infty} \frac{\sqrt{n}}{\log_2 n} = \infty$  $\lim_{h \to \infty} \frac{\ln \log_2 n}{(\log_2 n)^2} - \lim_{h \to \infty} \frac{\sqrt{n}}{\log_2 n}$  Ate  $h > \sqrt{n} \log_2 n > (\log_2 n)^2$  with  $\Rightarrow (\log_2 h)^2$ 

Figure 10: Solution to Section 7.4, problem 24

3. Section 8.2: Solutions, common mistakes and corrections:

$$\int e^{2X} \cos 3x \, dx = \frac{1}{3} \sin 3x \ e^{2X} - \int \frac{1}{3} \sin 3x \ (e^{2X}) \, dx$$

$$= \frac{1}{3} \sin 3x \ e^{2X} - \frac{2}{3} \int \sin 3x \ e^{2X} \, dx.$$

$$= \frac{1}{3} \sin 3x \ e^{2X} - \frac{2}{3} \left( \frac{1}{3} \left( -\cos 3x \right) e^{2X} - \int \frac{1}{3} \left( -\cos 3x \right) \left( e^{2X} \right) \, dx \right)$$

$$= \frac{1}{3} \sin 3x \ e^{2X} - \frac{2}{3} \left( \frac{1}{3} \left( -\cos 3x \right) e^{2X} - \int \frac{1}{3} \left( -\cos 3x \right) \left( e^{2X} \right) \, dx \right)$$

$$= \frac{1}{3} \sin 3x \ e^{2X} + \frac{2}{9} \cos 3x \ e^{2X} - \frac{4}{9} \int \cos 3x \ e^{2X} \, dx + \frac{1}{9} \cos 3x \ e^{2X} \, dx$$

$$\Rightarrow \int e^{2X} \cos 3x \, dx = \frac{1}{3} \sin 3x \ e^{2X} + \frac{2}{9} \cos 3x \ e^$$

Figure 11: Solution to Section 8.2, problem 23

 $dx \quad let u=J_{3}x_{4}$  $dx = \frac{2}{3}J_{5}x_{4}$  $dx = \frac{2}{3}J_{5}x_{4}$  $dx = \frac{2}{3}J_{5}x_{4}$ U df = dg $dg = e^{4}$  $)g = e^{4}$ (e"du) U 3 1+C 3X+9

Figure 12: Solution to Section 8.2, problem 25

 $\int_{3}^{\frac{1}{3}} x \tan^{2} x dx$   $\int_{-\infty}^{\frac{1}{3}} x \tan^{2} x dx$   $\int_{3}^{-\infty} x \tan x - x$   $\int_{3}^{\frac{1}{3}} \tan x - x dx$   $\int_{-\infty}^{\frac{1}{3}} \tan x - x dx$   $= x(\tan x - x) - \int_{-\infty}^{\frac{1}{3}} \tan x - x dx$   $= x \tan x - x^{2} - (-\ln|\cos x| - \frac{1}{2}x^{2})$ 

Figure 13: Solution to Section 8.2, problem 27

Jx tan x dx xdx=dx2  $= \frac{1}{2} \chi^{2} tan' \chi - \int \frac{1}{2} \chi^{2} \cdot \left(\frac{1}{\chi^{2}+1}\right) dx$  $= \frac{1}{2} \chi^{2} tan' \chi - \frac{1}{2} \int \frac{\chi}{\chi^{2}+1} dx$  $|=\frac{1}{2}\chi^{2}tan'\chi-\frac{1}{2}\int(|-\frac{1}{1+\chi^{2}})$  $\frac{-1}{2} - \frac{X}{2} + \frac{1}{2}$ 

Figure 14: Solution to Section 8.2, problem 51

 $\int c dx dx = \chi c dx - Sin(c dx) + C$ =  $\chi c dx - \sqrt{1 - \chi^2} + C$  $\theta = \cos^2 \chi \Rightarrow \sin \theta = \sqrt{1 - 1}$ . Yes, they are the same

Figure 15: Solution to Section 8.2, problem 75

Stanzdx = xtanx - ln sec(tanx) + C = xtanx - ln NI+xz + C Sec(tan''x) $\int \frac{x^{2}}{1} x \quad \theta = \tan^{-1} x$ => sec(tan^{-1}x) = sec \theta = 1/1 + x^{2} 1 ly sector 1x)= ly IItx2

Figure 16: Solution to Section 8.2, problem 76