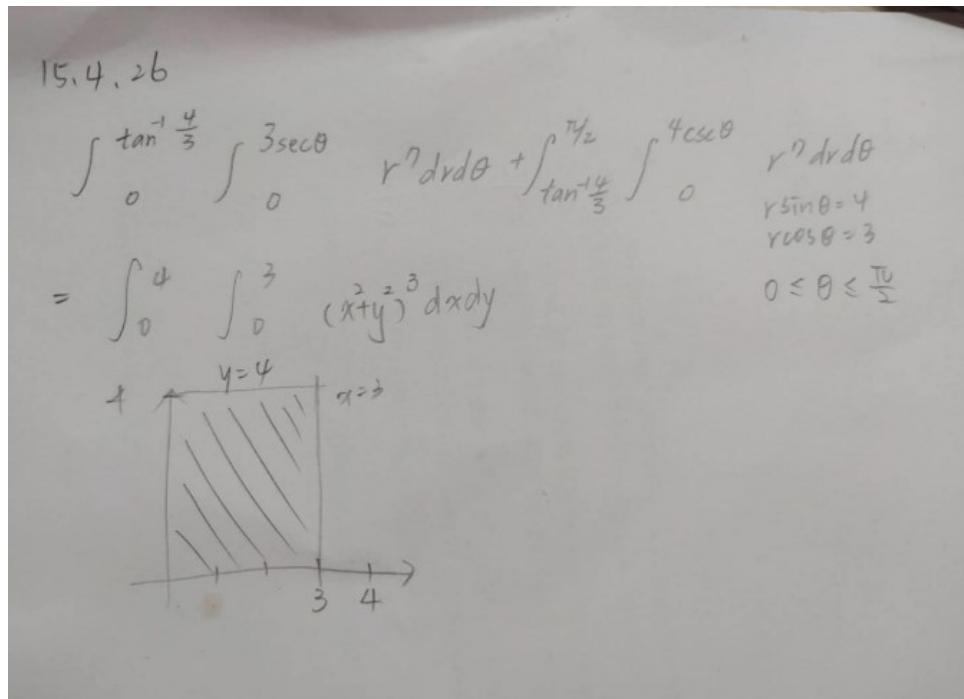
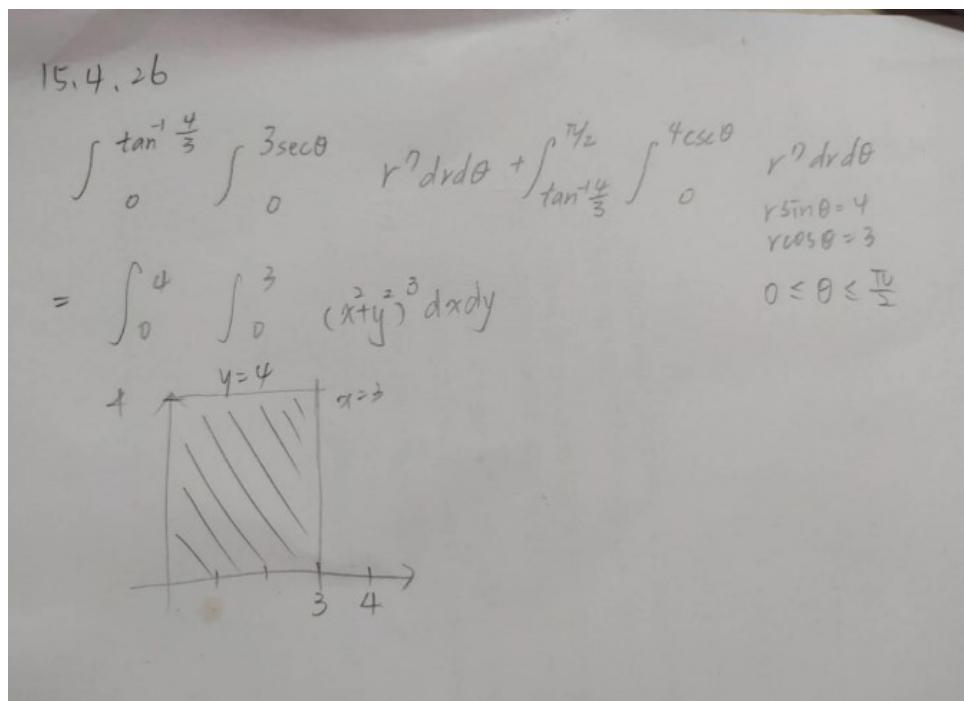


Brief solutions to selected problems in homework week 12

1. Section 15.4, problem 26:



2. Section 15.4, problem 42:



3. Section 15.5, problem 35:

$$\begin{aligned}
 V &= 2 \cdot \int_{-2}^2 \int_0^{\frac{1}{2}\sqrt{4-x^2}} \int_0^{x+2} dz dy dx \\
 &= 2 \int_{-2}^2 \int_0^{\frac{1}{2}\sqrt{4-x^2}} (x+2) dy dx = 2 \int_{-2}^2 (x+2) \frac{1}{2}\sqrt{4-x^2} dx \\
 &\quad \text{not } dx \downarrow \quad \text{not } dx \\
 &\quad \cancel{2 \int_{-2}^2 (\frac{1}{2}x^2 + 2x) \Big|_0^{\frac{1}{2}\sqrt{4-x^2}} dx} \quad \cancel{\int_{-2}^2 x\sqrt{4-x^2} dx} \\
 &= 2 \int_{-2}^2 \frac{1}{8}(4-x^2) + \sqrt{4-x^2} dx + \cancel{2 \int_{-2}^2 \sqrt{4-x^2} dx} \\
 &= 4\pi
 \end{aligned}$$

4. Section 15.5, problem 41:

The screenshot shows a digital notebook interface with a dark theme. The title bar includes the date and time (19:36 5月10日 週二), battery level (100%), and a tab for "Thomas Calculus 13th [Solutions]". The main area contains handwritten mathematical steps for problem 41:

$$\begin{aligned}
 41. \quad & \int_0^4 \int_0^z \int_0^{\sqrt{z-y}} \frac{\cos(x^2)}{\sqrt{z-y}} dy dz dx \\
 &= \int_0^4 \int_0^z \int_0^{\sqrt{z-y}} \frac{\cos(x^2)}{2\sqrt{z-y}} dy dz dx = \int_0^4 \int_0^z \frac{\cos(x^2)}{\sqrt{z-y}} dy dz \\
 &= \int_0^4 \left(\frac{\sin(x^2)}{2} \right) \Big|_0^z dz = \left[(\sin(x^2)) z^2 \right]_0^4 = 16\sin(16)
 \end{aligned}$$

5. Section 15.5, problem 43:

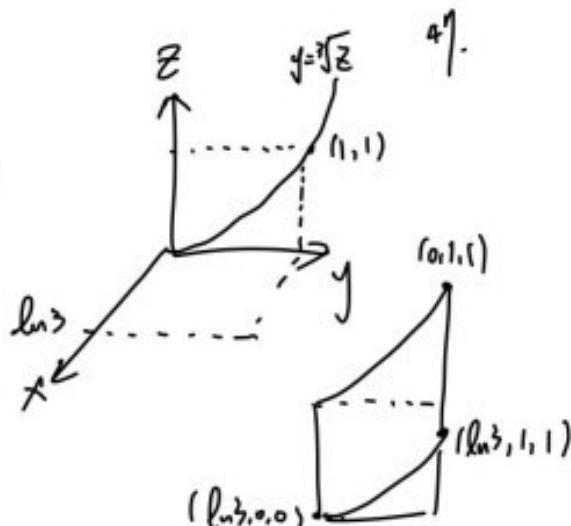
$$43. \quad x = \ln 3$$

$$x = 0$$

$$y = 1$$

$$y = \sqrt[3]{z} \Rightarrow y^3 = z$$

$$z = 1, z = 0$$



47.

$$\begin{aligned}
 & \int_0^1 \int_0^{\ln 3} \int_0^{y^3} \frac{x e^{zx} \sin xy^2}{y^2} dz dx dy \\
 &= \int_0^1 \int_0^{\ln 3} x e^{zx} \sin(xy^2) y dx dy \\
 &= \int_0^1 \frac{x}{2} y \sin(xy^2) e^{zx} \Big|_0^{\ln 3} dy \\
 &= \int_0^1 \frac{x}{2} y \sin(xy^2) (e^{\ln 3} - 1) dy \\
 &= \frac{8}{2} \pi \int_0^1 y \sin(xy^2) dy = \frac{8\pi}{2} \frac{1}{2\pi} \cos(xy^2) \Big|_0^1 \\
 &= -2(\cos \pi - \cos 0) = 4
 \end{aligned}$$