MAT104—Problems on Area, Volume and Length From Old Exams. Answers.

1. (a) 2π; (b) 9π.   **2.** $(e^2 - 1)\sqrt{2}$.   **3.** Volume $= \pi(e^{-2} - e^{-4})/2$;

$$\text{Surface Area} = \pi \left(\frac{\sqrt{e^2 + 1}}{e^2} - \frac{\sqrt{e^4 + 1}}{e^4} + \ln \left| \frac{\sqrt{1 + e^2} + 1}{\sqrt{1 + e^4} + 1} e \right| \right).$$

(or add $\pi/e^2 + \pi/e^4$.)   **4.** Area$(R) = 1 - \pi/4$; Volume$(S) = \pi(5/3 - \pi/2)$; Surface Area$(S) = \pi^2 - 2\pi$

$(\pi^2 - \pi)$.   **5.** (a) 5/6; (b) $17\pi/15$; (c) $11\pi/6$.   **6.** (a) $y = 3$; (b) $2\pi^2$.   **7.** $16\pi/3$.   **8.** $5/2 + \ln \frac{3}{2}/4$.

9. (a) $2\pi \int_1^2 x(x + x^2) \, dx = 73\pi/6$; (b) $2\pi \int_1^2 (3 - x)(x + x^2) \, dx = 65\pi/6$; (c) $\pi \int_1^2 (x + x^2)^2 \, dx = 481\pi/30$.

10. $\dfrac{dy}{dx} = \dfrac{\sin t + t \cos t}{\cos t - t \sin t}$.; $y = -2x/\pi + \pi/2$.   **11.** $\pi(e - 1)$; $\pi \int_0^1 e^{2x^2} \, dx$.   **12.** $\pi/6 \left((1 + 4e^2)^{3/2} - 5\sqrt{5} \right)$.

13. (a) $3\pi/5$; (b) $6\pi/7$.   **14.** $(e^2 - 1)/2e$.   **15.** (a) $\pi/2$; (b) $(5\sqrt{5} - 1)\pi/6$ $(5(\sqrt{5} + 1)\pi/6)$.   **16.**

$5a^3\pi^2$.   **17.** $(5\sqrt{5} - 1)\pi/6$.

Note. In problems where the surface area of the solid is to be computed, the answer indicated above in the parentheses is the *total* surface area of the solid, bases included. Both answers would be accepted as correct.